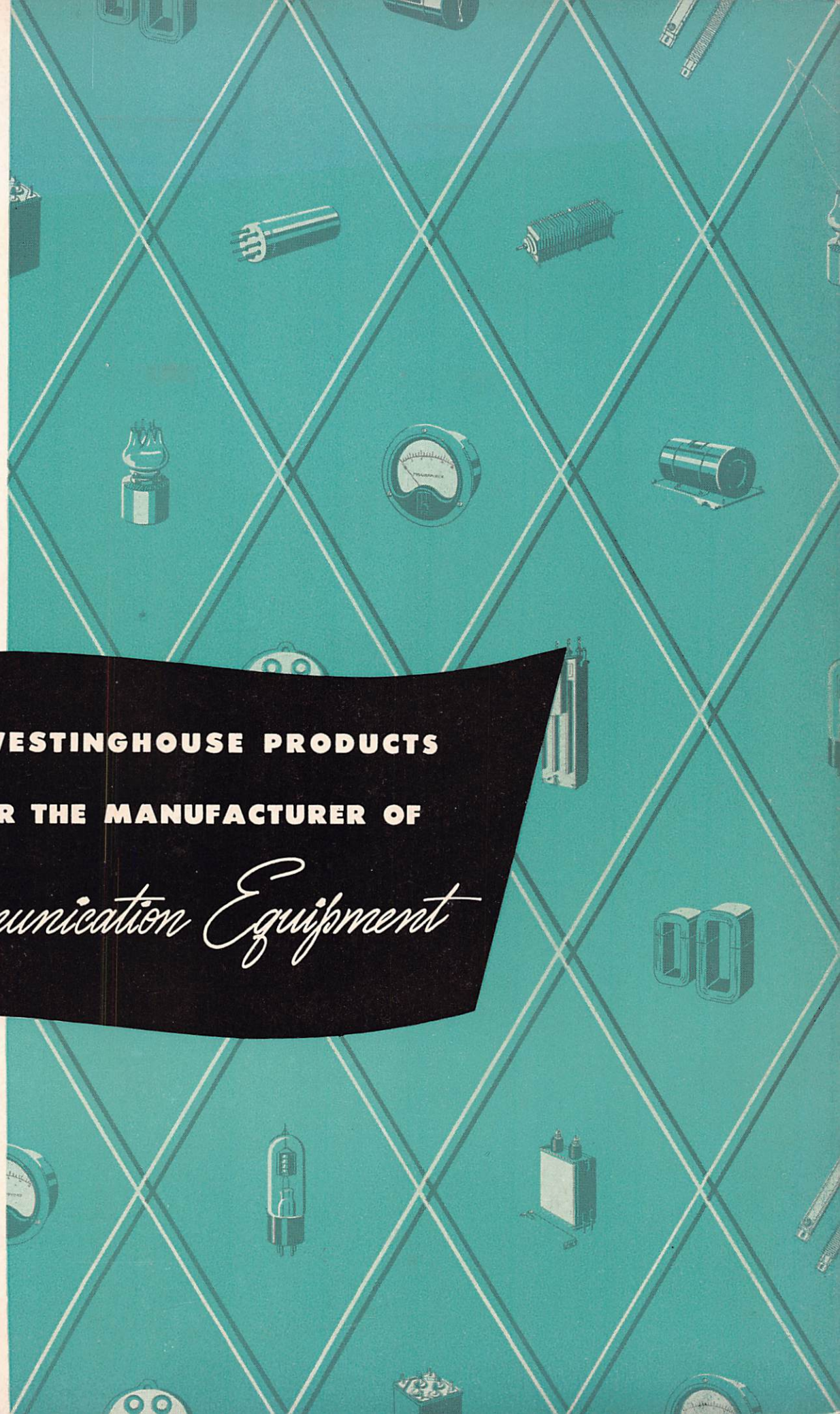
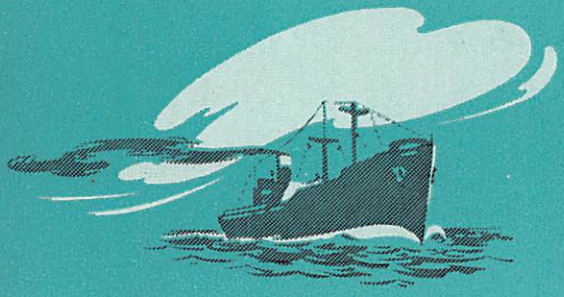
WESTINGHOUSE PRODUCTS

FOR THE MANUFACTURER OF

Communication Equipment



To help you solve problems of:



customer acceptance

industrial ruggedness

long life

control

compactness

weight reduction

high-altitude performance

high temperature

condensation

breathing

Quick facts about the product

Where it can be used . . . .

Its special characteristics . . . .

The purpose of this booklet is to provide designers of communication and electronic equipment with a quick list of Westinghouse products available for their use. Although many of the products described are well-known through years of industry-wide usage, some are entirely new. Intensive development and improvement work is being carried on continually on each of these products—to keep abreast of new conditions the engineer must meet in solving his problems.

This booklet is necessarily brief in its coverage of individual products. It cannot begin to show more than their salient features. Separate booklets covering details of each group of products are listed. You are invited to send for any of these booklets, or ask your Westinghouse representative for more details.

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Westinghouse

PRODUCTS AND APPLICATION EXPERIENCE ARE AT YOUR SERVICE

Westinghouse has been closely identified with radio since its earliest beginnings. A pioneer broadcasting station, KDKA, has been operated by the Company for more than twenty-five years. Its facilities, which are conveniently located near the Westinghouse Research Laboratory, are constantly used as a proving ground for checking new developments in radio equipment.

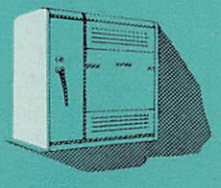
Westinghouse has developed, built and used practically every type of electrical equipment during the past fifty years. The benefits of this wide fund of electrical and radio experience in design and application are available to you in Westinghouse products, such as:

MATERIALS—Metals, alloys, plastics (Micarta) and insulating materials.

PARTS—Instruments, tubes, metallic rectifiers, motors, generators and control switchgear.

PLANT EQUIPMENT—Precipitron, transformers, load centers, switchgear, lighting and air conditioning equipment.

All Westinghouse materials and apparatus listed above are available to you for your own designed and manufactured products. None are held exclusively for Westinghouse use.



Information and assistance in applying them will gladly be provided by the Westinghouse office nearest you.

"De-ion" CIRCUIT BREAKERS

Typical Applications

switches

•

overload protection

•

short-circuit protection

•

load centers

•

lighting panelboards

•

power and distribution centers

Westinghouse "De-ion" air circuit breakers are now available for operating currents as low as 5 amperes and as high as 600 amperes—for potentials up to 600 volts, a-c and 250 volts, d-c. Interrupting capacities vary from 5,000 amperes for the Quicklag to 25,000 amperes for the L frame.

Special attachments provide design leeway for automatic equipment, including such special functions as:

1. Remote control by pushbutton or relay
2. Bell alarm or auxiliary contacts
3. Mechanical interlocks for safety, or for sequence control.

In many applications, "De-ion" breakers have a dual function serving both as switches and as protective devices. Thus, they are commonly applied as switches and overcurrent protectors for electronic tube filaments and rectifier power supplies.

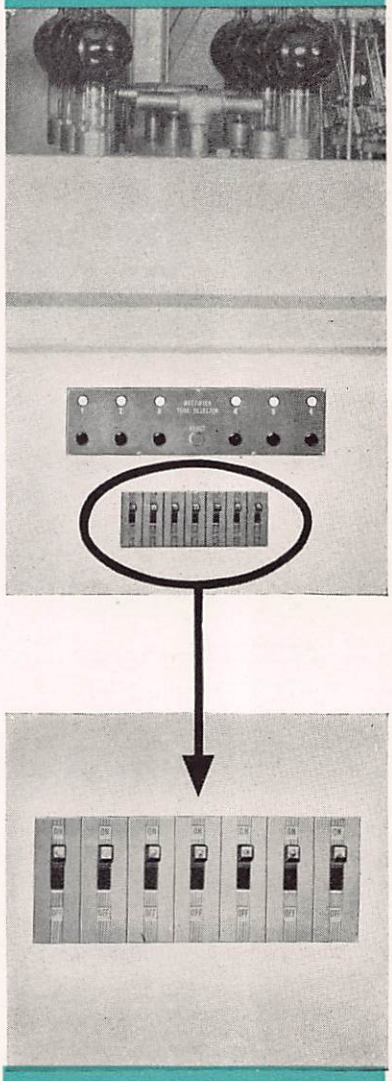
The advantages of Westinghouse AB "De-ion" breakers over other forms of interrupters are:

1. *More positive protection for components and circuits.* AB "De-ion" breakers calculate both current and time to discriminate between necessary and unnecessary trip-outs. They are accurately calibrated and production-tested at the factory. Furthermore, they *maintain* this calibration throughout the life of the equipment.

2. *Protection against lost time.* When an AB "De-ion" breaker trips out, the tripped breaker is clearly indicated by the position of the handle. Equipment goes back into operation fast—by simply flipping a switch. There is no need for replacements or special maintenance.

3. *Assured performance.* Sealed, insulating enclosures prevent tampering. Breakers cannot be bridged with nails or coins. They cannot be blocked closed.

4. *Protection against maintenance costs.* Nothing is destroyed—nothing must be replaced—when the breaker operates. First cost is final cost.



. . . . the new 5-ampere instantaneous trip

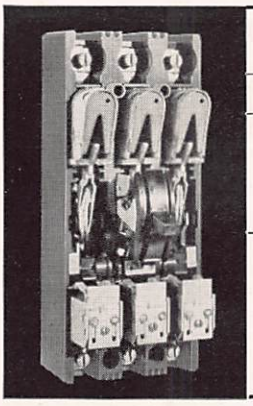
Westinghouse "De-ion" breakers have long been available in ratings from 15 amperes up. But the design of new electronic equipment, where relatively small currents are required, has created a definite need for a lower rated breaker of this type. To meet this need, Westinghouse has now developed "De-ion" breakers operating on currents as low as 5 amperes.

Consider the F frame breaker, for example, as most electronic applications will call for this type. This breaker has an instantaneous magnetic trip, which is adjustable, and which may be obtained to trip at only 5 amperes. It is available in 2 or 3-pole construction.

All ratings of the F frame breaker—from 5 to 100 amperes—are available in one compact breaker with uniform pole space and terminal arrangements. This standardization permits uniformity in mounting details and provides complete interchangeability between ratings.

An exclusive Westinghouse feature, available only in F frame, is an arrangement whereby contact pressure increases with wear. This prolongs the life of the breaker.

Another special feature of the F frame is the use of integral pressure connectors which simplify wiring and maintain efficient, dependable connections. F frame accommodates wire from No. 14 to No. 0. Where short-circuit protection is the principal requirement, the F frame breaker can be supplied with adjustable magnetic trip only. Adjustment is made simply by removing the cover and sliding the calibrated plate to the current value desired.



Adjustable magnetic trip only
Front, back or rear connection on both ends

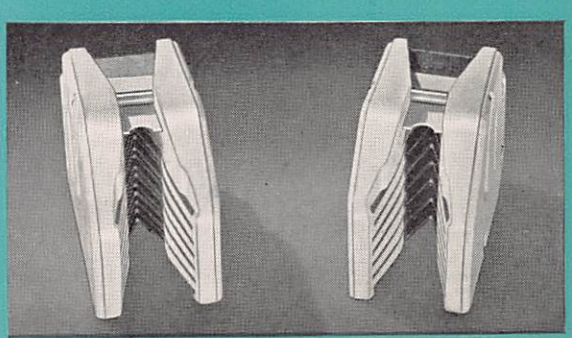
600 Volts, a-c or 250 Volts, d-c

Ampere Rating	Magnetic Trip Setting		Volts		Poles	Approximate Shipping Weight (lbs.)
	Min.	Max.	A-C	D-C		
5	5	15	600	250	2 or 3	6
10	12	35	600	250	2 or 3	6
25	30	80	600	250	2 or 3	6
50	70	180	600	250	2 or 3	6
70	100	270	600	250	2 or 3	6
100	170	480	600	250	2 or 3	6
100	450	1,200	600	250	2 or 3	6

Quick Product Facts

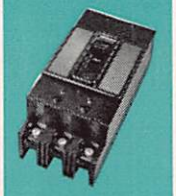
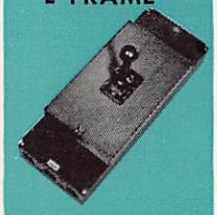
Secret of the high efficiency of Westinghouse breakers is the "De-ion" arc quencher. It snuffs the arc quickly in a small space.

Basically, the "De-ion" quencher is an arc chamber (one per pole) containing a grid of parallel steel plates. The arc, formed as the contacts open, is whipped into the chamber by its own magnetic field and chopped into small whirling arcs by the grid. Each small arc has but little energy which is quickly lost. Burning and pitting are nearly eliminated and the space required for the breaker is reduced to a minimum.



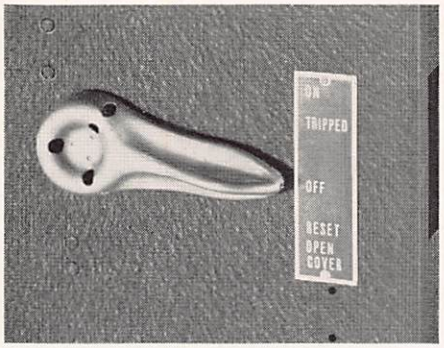
CIRCUIT BREAKERS

Selection Data

CIRCUIT BREAKER	QUICKLAG	E FRAME		F FRAME	G FRAME	K FRAME	L FRAME
							
	(1 pole)	(1 pole)	(2-3 pole)	(2-3 pole)	(2-3 pole)	(2-3 pole)	(2-3 pole)
Standard Ampere Ratings	10–50	10-50*,20*, 25,35,50	10–50	15–100	50–100	70–225	125–600
*New Ampere Ratings	5	5, 70	5, 70	5, 8, 10, 12	15, 20, 25 ,35		70, 90, 100
A-C Voltage Ratings	125	125	250	250 & 600	250& 600	250 & 600	250 & 600
D-C Voltage Ratings	None	125	125/ 250	125/250 & 250	125/250 & 250	125/250 & 250	125/250 & 250
Underwriters' Laboratories Interrupting Rating (Amperes)	5,000	5,000	5,000	5,000 & 10,000	5,000 & 10,000	10,000	10,000
NEMA Interrupting Capacity (Amperes—a-c)	5,000	5,000	5,000	15,000	15,000	15,000	25,000
STANDARD FEATURES — Quick-make, Quick-break Mechanism	✓	✓		✓	✓	✓	✓
Type of Trip — Thermal Only		✓					
Type of Trip — Both Thermal & Magnetic	✓			✓	✓	✓	✓
Type of Trip — Interchangeable					✓	✓	✓
Type of Trip — Noninterchangeable	✓	✓		✓			
Adjustable Magnetic Trip				✓	✓		
Nonadjustable Magnetic Trip	✓			✓		✓	✓
Magnetic Trip Only				✓	✓	✓	✓
SPECIAL FEATURES AVAILABLE — Nonautomatic Features		✓		✓	✓	✓	✓
**Shunt Trip Attachment					✓	✓	✓
**Undervoltage Release Attachment					✓	✓	✓
**Bell Alarm Switches				✓	✓	✓	✓
**Auxiliary Switches				✓	✓	✓	✓
Electrically Operated						✓	✓
Mechanical Interlock		✓		✓	✓	✓	✓

†Magnetic trip only—thermal omitted. **These devices are mounted inside the breaker case, and require no additional space.
*New ratings have reduced interrupting capacity and do not carry Underwriters' Laboratories approval.

. . . new Westinghouse handle mechanism insures safety of personnel . . . complete circuit protection



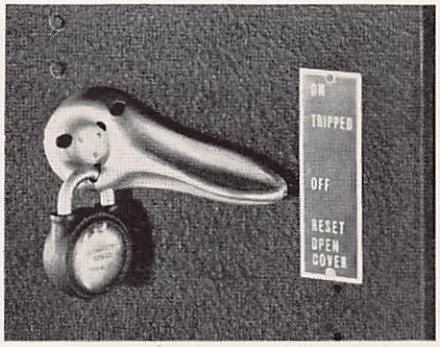
Visible indicator of circuit breaker position. Breaker handle definitely and clearly indicates whether breaker is in "ON", "OFF" or "TRIPPED" position.

There is a growing need for an inexpensive interlock to protect workers who must operate and maintain the smaller electronic and electrical equipment which is finding new uses in industry. The handle mechanism shown here—when used with any of the "De-ion" circuit breakers except the Quicklag—can often provide the measure of safety which is today considered necessary.

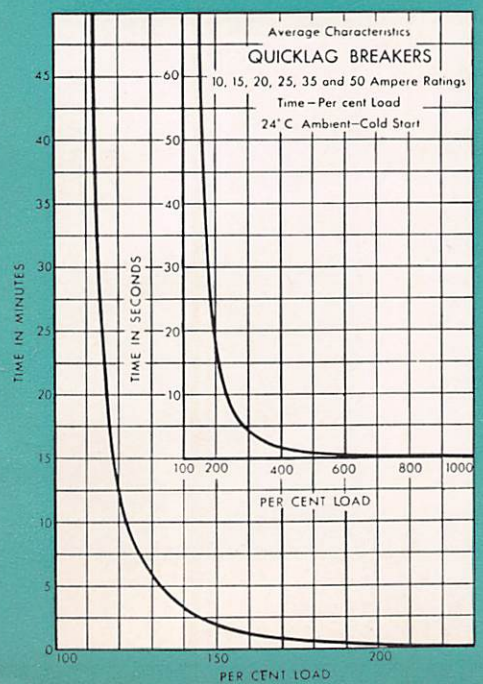
This handle, complete with necessary parts, is available for attachment to the doors of cabinets and enclosures. Dimensions and other details for applying these handles to your enclosures may be obtained from your nearest Westinghouse office.

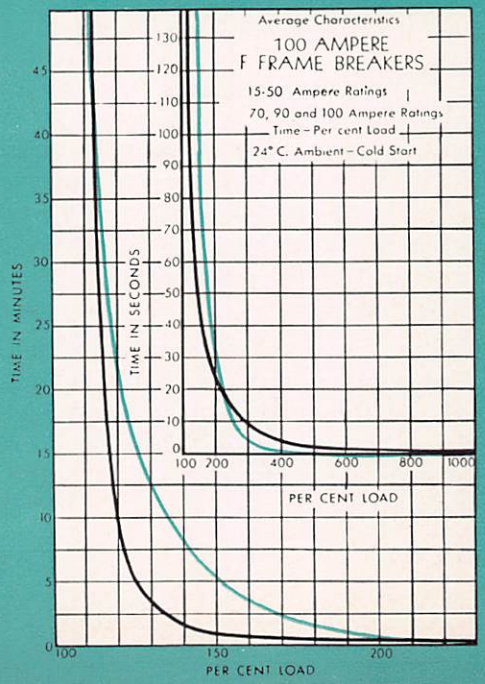
Handle being moved to open cover position for access to the cabinet. Cover is locked closed for all other positions of the handle.

Interlock release can be provided, if desired (see slotted screw below handle). This permits opening the cover with the breaker in "ON" position.



Handle may be padlocked in "OFF" position. As many as three locks may be used to meet rigid safety requirements. When handle is locked, door cannot be opened.





In these two charts are performance characteristics for two of the "De-ion" breakers in the Westinghouse line. Performance curves for the complete line of Westinghouse breakers—plus comprehensive engineering and application data—are contained in Descriptive Data 29-060. Complete information on the Westinghouse Handle Mechanism is contained in Folder B-3840. Ask for them.

ELECTRONIC TUBES

Typical Applications

amplifiers • oscillators • generators

PLIOTRONS

These high-vacuum tubes are available in air-cooled, forced air-cooled and water-cooled types, in properly proportioned ratings up to 140 kw plate input.

They are used in transmitters, induction and dielectric heaters and other electronic devices in modulator, amplifier and oscillator circuits.

rectifiers

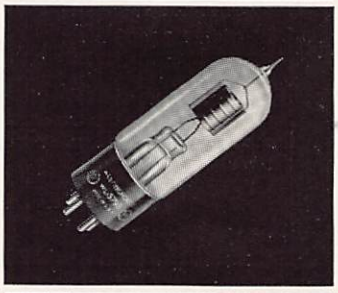
PHANOTRONS

Gas or mercury-vapor rectifiers, Phanotrons can supply moderate amounts of direct current at voltages up to 22,000 volts for the plate supply of amplifiers and oscillators. Westinghouse Phanotrons include tubes at ratings to meet a wide variety of power applications.

rectifiers

KENOTRONS

Kenotrons are high-vacuum diode rectifier tubes available in sizes to withstand inverse peaks as high as 230,000 volts. Applications are made in x-ray, high-voltage testing, electrostatic precipitation, and other devices where high-voltage, low-current d-c is used.



rectifiers • control

IGNITRONS

Ignitrons are rectifier tubes, useful where heavy power is required. The tube—a mercury pool type—is fired by means of the Ignitor—a Westinghouse development which provides for precise starting at any point of the positive cycle without inefficient keep-alive arcs.

Ignitrons are commonly used in resistance welders, inverters, rectifiers and heavy-duty electronic switches. These switches are comparatively new devices which operate within one-half cycle and without moving parts.

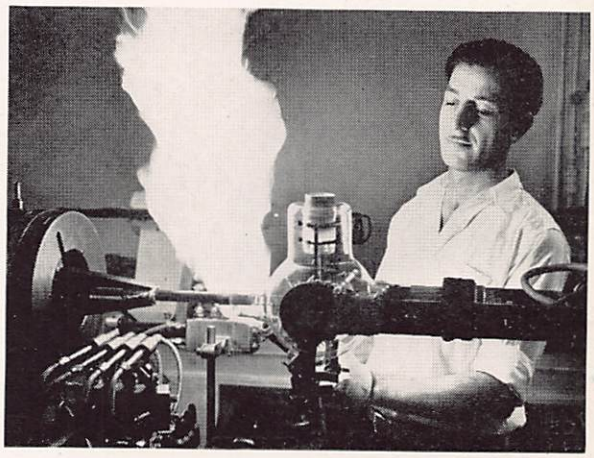
. . . for communications . . . radio . . . electronics

Quick Product Facts

No electronic device can be better than the tubes it uses . . . and Westinghouse tube plants apply complete quality control from raw materials to finished tube.

Assembly rooms are air conditioned to assure absolute cleanliness. An automatic exhaust machine was designed to provide uniform high-speed exhaust for popular types of tubes. A special alloy—Kovar "A"—was developed to make certain the bond of metal to glass is strong and permanent.

Testing is rigid and never compromised, from the first check of tungsten ore and ammonium molybdate, to the final x-ray of tubes to make sure internal parts are in perfect alignment.



A skilled artisan uses flame to anneal the seals of large size tubes.

rectifiers • control

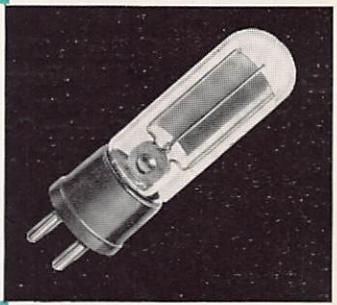
THYRATRONS

Thyratrons are grid-controlled, gas or mercury vapor rectifiers. They are commonly used in resistance welders, rectifiers, inverters and electronic switches of limited power. They may be accurately controlled by phase shifting circuits and are often used to supply firing power to the ignitor of Ignitron tubes.

control • counters • sorters

PHOTOTUBES

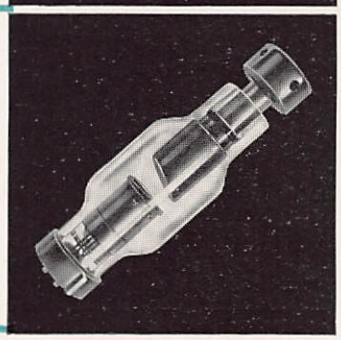
Phototubes permit the passage of electrons when exposed to visible light, ultraviolet or infrared. They are applied in devices that control lighting, count objects on conveyer belts, match colors, open doors, detect smoke, control temperatures and keep printing presses in registry.



x-ray

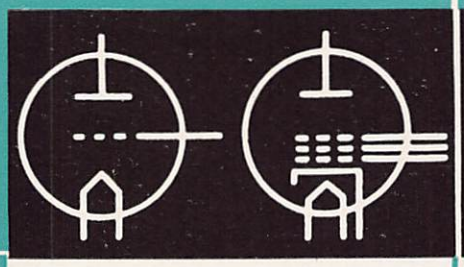
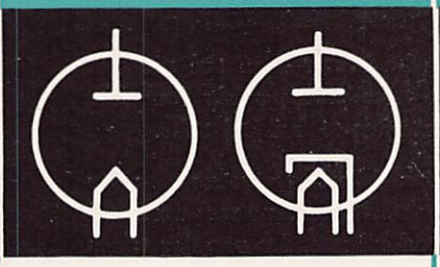
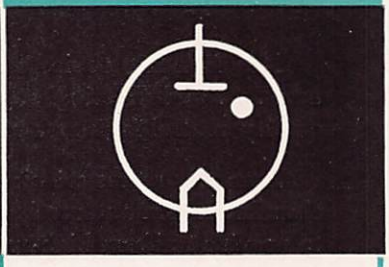
X-RAY TUBES

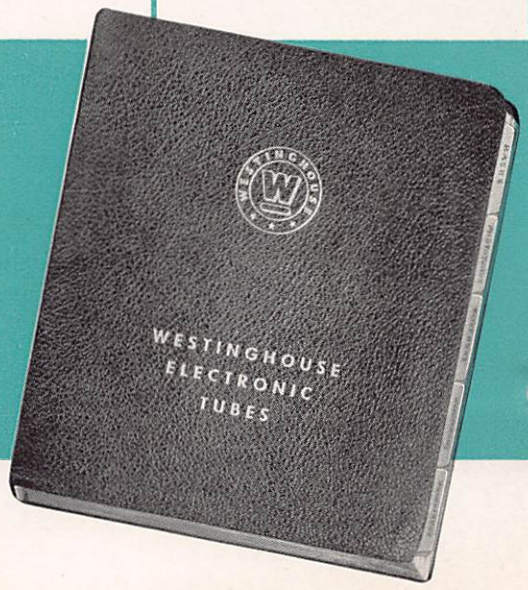
Westinghouse is a pioneer in the manufacture of that group of tubes which convert electricity into x-rays. They are available in a wide range of ratings suitable for medical or industrial inspection equipment of types utilizing either fluoroscopic screens or photographic recording.



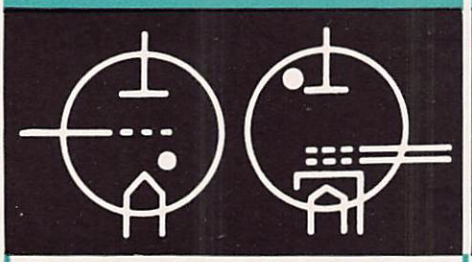
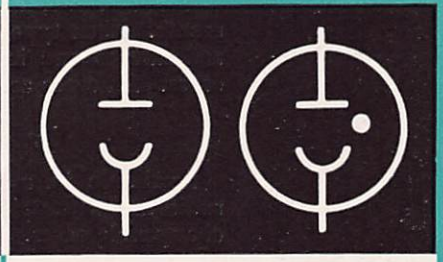
SEE PAGES 12 AND 13 FOR SYMBOLS AND SELECTION DATA.

ELECTRONIC TUBES

tube	pliotron	kenotron	phanotron
SYMBOL			
CONDUCTING MEDIUM	Vacuum	Vacuum	Mercury Vapor
NUMBER OF ELEMENTS	3 or more	2	2
TYPE OF CONTROL	Electrostatic (Grid)	None	None
APPLICATION	Oscillation, Modulation, Amplification	Rectifies Low Values of Current—often at High Voltages	Rectification of Moderate Currents at Voltages up to 22,000
TYPICAL EXAMPLES	Radio Transmitters High-Frequency Heating Control Carrier Current	Transmitters X-ray Electrostatic Precipitator	Transmitters Industrial Equipment



. . . symbols and selection data

thyratron	ignitron	phototubes
		
Gas or Mercury Vapor	Mercury Vapor	Vacuum or Gas
3 or 4	3	2 or more
Electrostatic (Grid)	Ignitor	Light Variation
Control or Controlled Rectification of Moderate Currents at Voltages up to 15,000	Rectification, Conversion and Control of Large Amounts of Power	Vacuum types are accurate in that they respond in direct proportion to the light falling on them. They may be used for audio frequencies. Gas types are non-linear in response. They give larger output when activated than vacuum types—are adapted to trigger action control.
Welding Control Timing Circuits Motor Control Voltage Regulation Transmitters	Tube Testing Large Transmitters Electrochemical Processes	Sound Movies Pinhole Detector Cutter, Winding and Printing Control

More Information?

Write for your free copy of booklet SP-204 for complete engineering information on electronic tubes, their functions, ratings and applications.

INSTRUMENTS

Typical Applications

miniature panels

TYPE 33 SERIES—2½″ CLASS

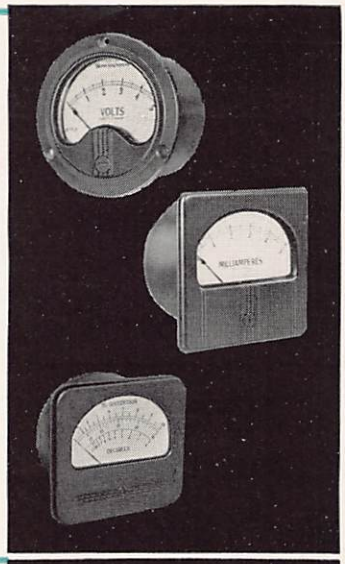
For d-c, a-c, audio and radio-frequency measurements. Each type is available in a full range of standard ratings and in any one of five different styles of cases. All cases are interchangeable.

TYPE 35 SERIES—3½″ CLASS

Available in a variety of mountings covering all radio and industrial applications. Choice of five interchangeable cases.

TYPE 37 SERIES—4½″ CLASS

Largest of the miniature panel instruments, this series is applied on many radio broadcasting station panels. Five different cases are interchangeable.



switchboards

K-24 LINE—4½″ CIRCULAR SCALE CLASS

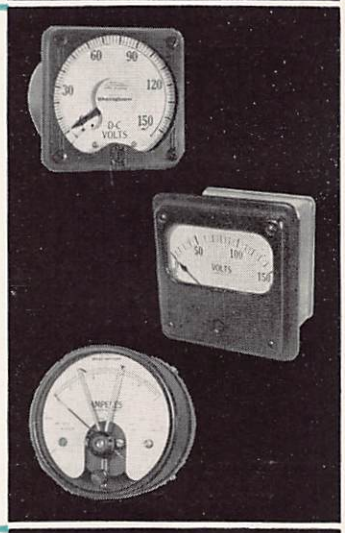
Circular scale instruments are the most modern of the 1% accuracy group. They have uniform appearance, and are easily read from a distance because their scales are 2½ times as long as those on conventional instruments of the same size. Complete ratings—shielded, rectangular, flush cases.

TYPE 25 SERIES—6″ CLASS

A larger, 1% accuracy instrument with a complete variety of mechanisms and ratings for all electrical measurements. Flush or surface mounting, rectangular shielded cases.

TYPE D SERIES—4½″ CLASS

Medium size, 1% accuracy instruments. Round, shielded cases; complete ratings.



portable and recording

TYPE P-5 SERIES

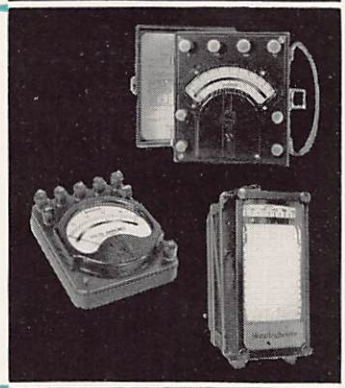
½% accuracy, 5″ scale. Designed to withstand severe portable service, yet maintain their high degree of accuracy.

TYPE P-14 SERIES

1% accuracy, 2.8″ to 3.2″ scales. A pocket-size instrument with many applications for laboratory workers, inspectors and field engineers.

TYPE G-40 SERIES

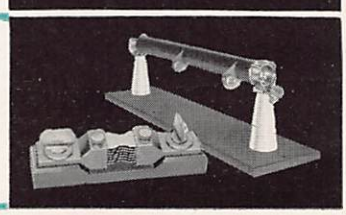
Provides reliable, permanent chart records of d-c and a-c electrical quantities.



auxiliaries

CURRENT SHUNTS, VOLTAGE MULTIPLIERS, PORTABLE TRANSFORMERS

For electrical measurements in circuits which exceed the rating of self-contained instruments.



miniature panel . . . switchboard . . . portable . . . recording

Quick Product Facts

Westinghouse instruments are built to perform under all kinds of service. From the miniature 2½-inch panel class to the large switchboard types, they are built to the highest standard of accuracy.

Pivots, for example, are heat-treated in a closely controlled electric furnace, especially developed for the purpose by Westinghouse. They are checked by photomicroscopes to insure that correct grain structure has been attained. Each pivot is projection magnified to 500 diameters to check the radius. The result is a pivot approved by leading authorities for electronic equipment instruments which are to be subjected to the severe service found in aircraft, trucks and trains.

Springs, dials and scales are all produced with the same precision and accuracy—to insure long, wear-resisting life.

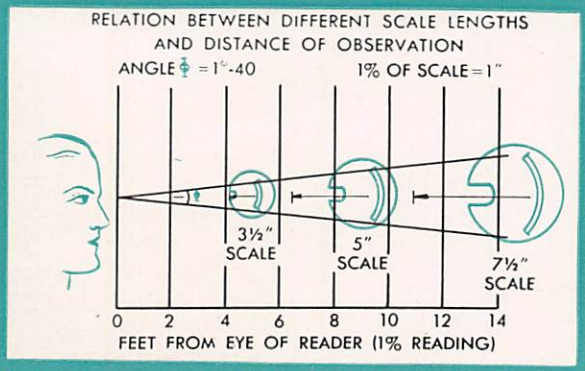
Precision assembly of springs for Westinghouse instruments is assured by use of accurate jigs.

Rigid torque inspection guarantees spring assembly of uniform quality.

Selection Data

The matter of selection of the size to suit any given application is one to be decided on the basis of (a) readability from a distance, (b) accuracy and (c) the limitation of panel space.

The common sizes of instruments used in the communications industry are the 2½" and 3½" classes, although there is frequent requirement for 4½" and 6" sizes. A scale length should be chosen to give satisfactory readability from the place where the observer is likely to stand when taking readings. However, for many operating routines, an *approximate* reading is sufficient for the moment. For closer reading, the observer may come near the instrument.

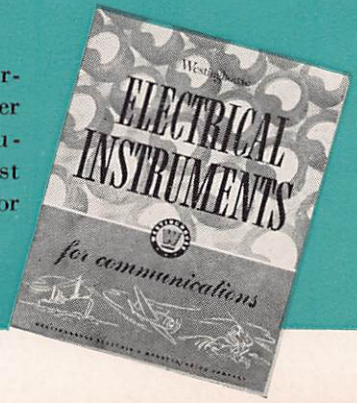


Indicates, approximately, the relation between scale length and the distance of observation for the various sizes of instruments.

The larger instruments, up to 6 or 7 inches, are designated as switchboard type and usually have 5 to 6-inch scales. Closely allied to the consideration of size is the subject of accuracy.

MORE INFORMATION

For complete information on the proper selection of instruments, ask your nearest Westinghouse office for booklet B-3283.



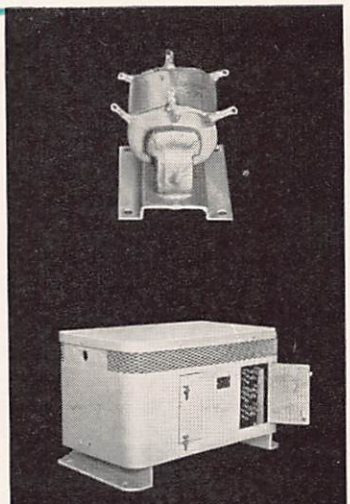
TRANSFORMERS

Typical Applications

transmitters • receivers • high-frequency heaters

DRY-TYPE

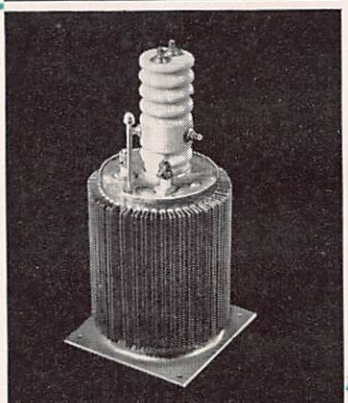
Although economical in weight, space and cost, dry-type transformers have, in the past, been limited to a few applications. With newly developed insulating materials—such as Fosterite, Silicones and Fiberglas—and new techniques, Westinghouse is building dry-type transformers daily for applications beyond those that have been considered normal in the past. For instance, plate, filament, oscillator blocking and pulse transformers operating at 10 kv are now practical. Fosterite-treated units have proved satisfactory in many applications involving heat, humidity and condensation.



transmitters • receivers

OIL-INSULATED

Oil-insulated transformers are available in all ratings and voltages for plate, filament, pulse or oscillator blocking applications. Filter and charging chokes of oil-insulated construction are also available. This type of component can be designed for use under most unusual or severe conditions.

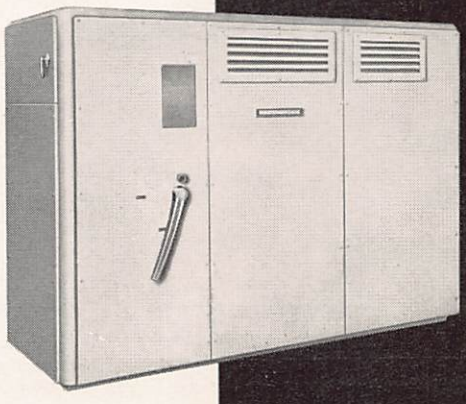


broadcast stations • industrial plants

POWER CENTER

The Westinghouse power center has been developed to meet the need for "Packaged Power" . . . a complete, compact factory-co-ordinated substation which can be installed quickly at a low cost at the load center.

For indoor installations the dry-type air-cooled power center is recommended in three-phase ratings of 100 to 2,000 kva, to transform from 15,000 volts or less to 600 volts or less.



. . . power . . . plate . . . filament . . . pulse . . . modulation

transmitters

TAP-CHANGING

A tap-changing transformer performs dual functions when used in the substation for a broadcast transmitter: (1) it transforms power line voltage to that used by the transmitter; (2) it automatically maintains the selected voltage through power line fluctuations. Voltage steps are small and radio station listeners are unable to notice a change during automatic regulation.

Quick Product Facts

Research in magnetic materials and circuits has been uninterrupted at the Westinghouse Transformer Division for 36 years. Important results include Hipersil materials and the Type C and RC core constructions. These were originally used for large cores in distribution transformers. Developments over the past few years have extended Type C cores to sizes which will fit on a dime and which utilize fully-oriented Hipersil in laminations as thin as 1 mil.

Westinghouse designers also make use of nickel-iron alloys—Hipernik and Conpernik—when they are indicated. These, too, are Westinghouse developments.

Research in insulation—both liquid and solid—is another continuous effort at Westinghouse. A recent development is Fosterite, a superior treatment for open transformers that keeps their weight advantages, but attains new highs in insulation strength and resistance to corona and moisture.

A third phase of research is the co-ordination of these materials through fundamental transformer design into one device . . . the transformer. Examples: (1) large, dry-type pulse transformers; (2) the first nonexplosive and essentially fireproof transformer with air-cooled, dry-type construction for modulation and rectification in large commercial transmitters; (3) automatic tap-changing transformers; (4) power centers; (5) CSP (completely self-protected) equipment.

Selection Data

Normally, the transformers required by radio and electronics engineers for their equipment are designed for the application. Westinghouse engineers are available, through the nearest District Office, for conference on any transformer problem.

Power center booklet B-3224 offers useful help in specifying larger substation equipment for broadcast stations or manufacturing plants. It contains a quick selector system for transformers and associated protective and operating apparatus. Booklet B-3459 describes air-cooled transformers in large kva ratings and their application advantages.

METALLIC RECTIFIERS

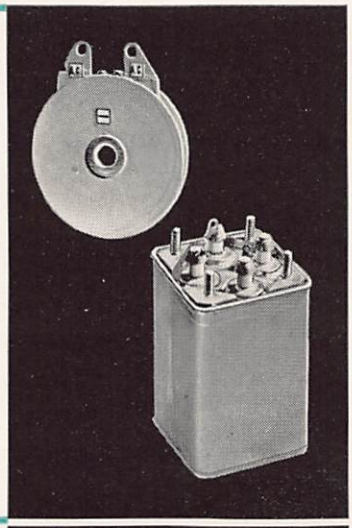
Typical Applications

elements for rectifiers • tube eliminators

RECTOX AND SELENIUM RECTIFIER STACKS

The electronics engineer has widely applied both the Rectox copper-oxide and selenium type rectifiers. Performance of Rectox-equipped transmitters over many years justifies the confidence of designers and operators alike.

Selenium or copper-oxide stacks are available for assembly in your transmitters and electronic devices. Their versatility is shown by the wide range of sizes —from an electroplating installation of 48 units at 30 kw each to the type used in high-frequency instruments, rated at 3 milliwatts. (Photo at right and on opposite page show a variety of stacks available.)



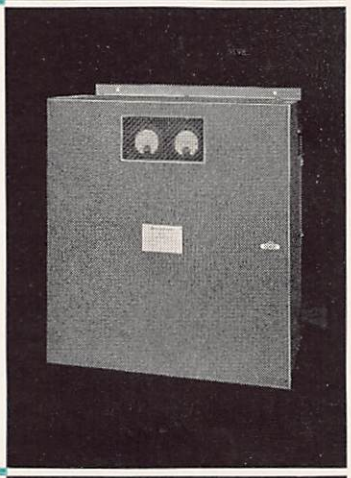
battery chargers • power packs

BATTERY CHARGERS

Automatic and standard type chargers find special uses in telephone systems and radio stations.

POWER PACKS

Highly reliable, long-lived, d-c power packs perform important functions in powering relays and indicating lamps on studio equipment. Input and output filters are supplied as needed to prevent interference with audio systems. The voltage output from no load to full load can be stabilized by static regulating circuits.

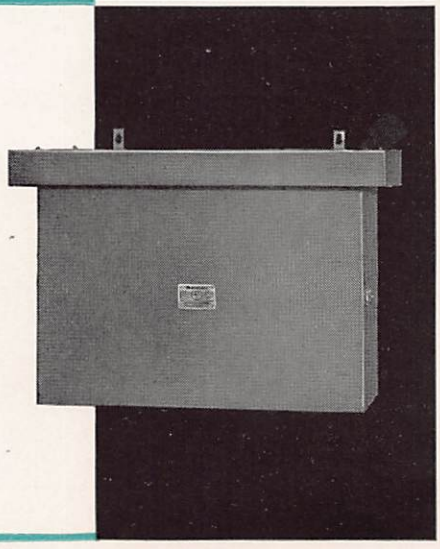


underground cable and conduit protection

CATHODIC PROTECTORS

Cables and other buried structures are subjected to a natural galvanic action which may cause serious corrosion, resulting in expensive maintenance and eventual replacement. Electrolysis may be counteracted and practically eliminated by maintaining a small direct current from ground to structure. This process is known as "cathodic protection".

A Rectox rectifier is the most economical, efficient and dependable means of obtaining the required direct-current potential for cathodic protection.

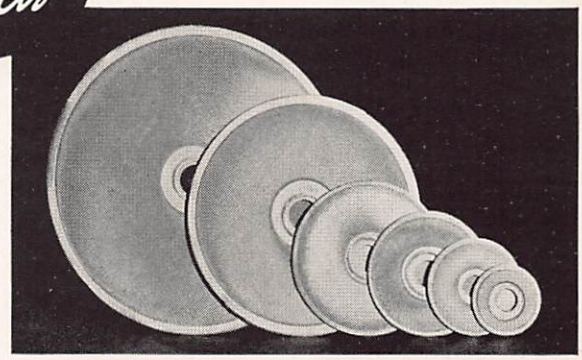


. . . rectox copper-oxide . . . Westinghouse selenium

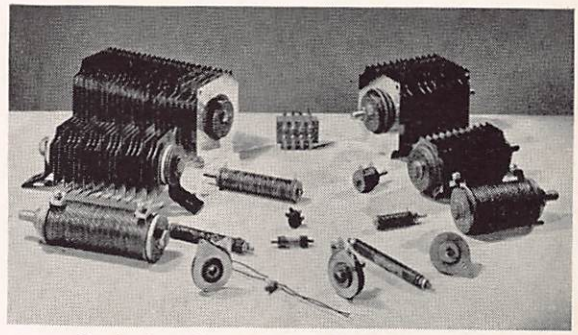
Quick Product Facts

Because of inherent characteristics, Rectox copper-oxide rectifiers have earned the reputation of being "permanent" rectifiers. Thousands still operating were placed in use before 1930, many in circuits where the utmost in dependability is essential, such as police and fire alarm systems. Their record in large transmitters has won operator approval.

Where minimum space and weight are dominant factors, specify Westinghouse selenium rectifiers, and thus take advantage of a nine-year research program that has resulted in a selenium rectifier that has no equal. Efficiency is as good as the best and better than most. Aging characteristics are best by test. Maximum dependability and longest life expectancy are indicated by superior aging characteristics. Can be operated at exceptionally high temperatures. Can be supplied oil-immersed in hermetically-sealed container with solder-sealed terminals.



Selenium discs—1″ to 4⅜″ in diameter.



Typical stacks of Rectox discs showing wide variety of Westinghouse rectifying elements.

Selection Data

RECTIFIER UNIT CONNECTIONS	Cell No.	1			2			3			4			5			6		
	Cell Dia.	1″			1⅜″			1¾″			2⅛″			3⅜″			4⅜″		
	D-C Volts	CELLS			CELLS			CELLS			CELLS			CELLS			CELLS Wide Spacing		
		1-8	9-20	21-40	1-8	9-20	21-40	1-8	9-20	21-40	1-8	9-20	21-40	1-8	9-16	17-36	1-8	9-16	1-36
		MAXIMUM D-C CURRENT IN AMPERES																	
SINGLE PHASE - HALF WAVE — EAC = 2.3 (EDC + ER); IAC = 1.57 IDC; Ripple Freq = f; Approx. Ripple = 121%	6	.125	.100	.075	.240	.190	.150	.465	.37	.300	.75	.6	.5	1.60	1.35	1.25	2.50	2.25	2.0
SINGLE PHASE - CENTER TAP — EAC/2 = 1.15 (EDC + ER); IAC = 785 IDC; Ripple Freq = 2f; Approx. Ripple = 48%	6	.250	.200	.150	.480	.380	.300	.935	.74	.600	1.5	1.2	1.0	3.25	2.75	2.50	5.0	4.5	4.0
SINGLE PHASE - BRIDGE — EAC = 1.15 (EDC + ER); IAC = 1.15 IDC; Ripple Freq = 2f; Approx. Ripple = 48%	12	.250	.200	.150	.480	.380	.300	.935	74	.600	1.5	1.2	1.0	3.25	2.75	2.50	5.0	4.5	4.0
THREE PHASE - HALF WAVE — EAC = 86 (EDC + ER); IAC = 585 IDC; Ripple Freq = 3f; Approx. Ripple = 18%	8	.335	.265	.200	640	510	400	1.25	.99	.800	2.0	1.6	1.35	4.40	3.70	3.40	6.75	6.0	5.4
THREE PHASE - BRIDGE — EAC = 74 (EDC + ER); IAC = 85 IDC; Ripple Freq = 6f; Approx. Ripple = 4.2%	16	.375	.300	.225	720	.575	.450	1.40	1.10	.900	2.25	1.8	1.5	4.85	4.10	3.75	7.50	6.75	6.0
SIX PHASE - STAR — EAC/2 = 74 (EDC + ER); IAC = 41 IDC; Ripple Freq = 6f; Approx. Ripple = 4.2%	8	.475	.375	.285	910	730	570	1.75	1.40	1.14	2.85	2.3	1.9	6.10	5.20	4.75	9.50	8.5	7.6
THREE PHASE - DOUBLE WYE — EAC = 85 (EDC + ER); IAC = 287 IDC; Ripple Freq = 6f; Approx. Ripple = 4.2%	6 8	75	.600	.450	1.44	1.15	.900	2.80	2.20	1.80	4.5	3.6	3.0	9.70	8.20	7.5	15.0	13.5	12.0
D-C - VALVE	15	195	.160	12	.380	.30	.235	730	.580	470	1.18	.94	.785	2.50	2.10	1.95	3.90	3.50	3.15

SYMBOL ABBREVIATIONS

ER = Average Voltage Drop thru rectifier
EAC = (RMS) A-C input voltage
IAC = (RMS) A-C line current

$$\% \text{ Ripple} = \frac{\text{(RMS) A-C Ripple Voltage} \times 100}{\text{Average D-C Voltage}} \text{ (Resistance load)}$$

f = Input frequency
IDC = Average D-C load current
EDC = Average D-C output voltage

MORE INFORMATION

The table shows maximum ratings of Westinghouse self-cooled selenium rectifiers of standard cell spacing, operating in an ambient temperature of 35°C. It is reproduced from DB-19-060. Copy of this bulletin or other information concerning selenium and Rectox rectifiers will be supplied upon request by the nearest Westinghouse office.

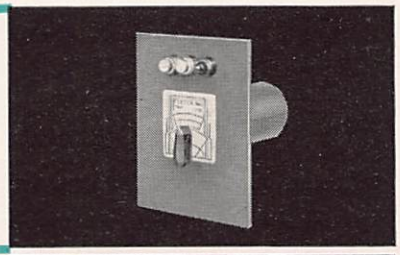
CONTROL DEVICES

Typical Applications

manual circuit control

CONTROL SWITCHES

Minatrol and Type W selector switches are available with contact arrangements suitable for most control circuits. Pushbuttons are available in several models.



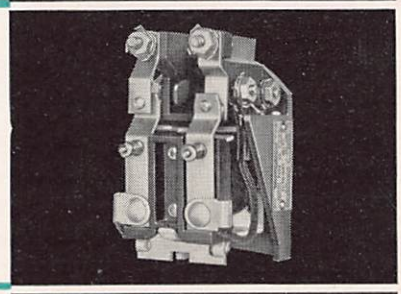
electrically operated circuit control

CONTACTORS

Air break contactors with standard pole combinations are available for 5 to 2,500 amperes, 600 volts maximum, a-c or d-c. Oil-immersed contactors operate up to 5,000 volts at 200 amps.

Westinghouse-developed "De-ion" arc interruption is used in heavier ratings.

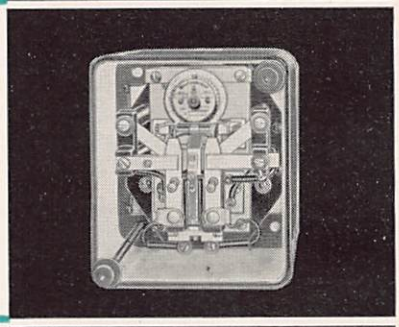
Type SG auxiliary relay is illustrated.



process control

TIMERS

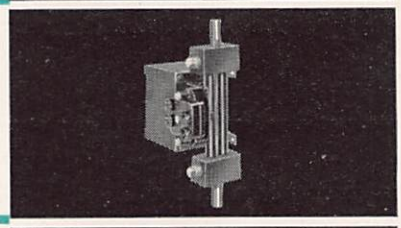
Standard Westinghouse electronic timers are adjustable from one-half cycle to 45 seconds. Those driven by synchronous motors are adjustable from 2 seconds to 50 minutes.



equipment protection

RELAYS

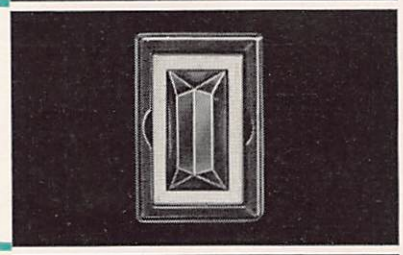
Westinghouse relays include both auxiliary and protective types, built for heavy-duty service on industrial electronic equipment. Electrostatic flow switch for water-cooled tubes is shown.



switchboards • control desks

INDICATING LAMPS

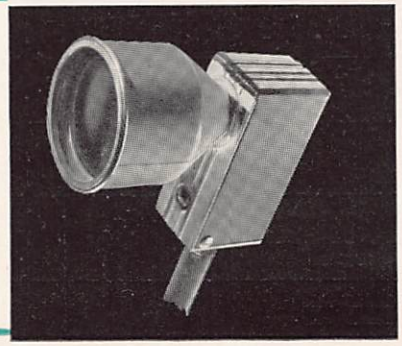
Westinghouse indicating lamps are designed for use in industrial equipment such as transmitters and high-frequency electronic heaters. Miniature (round or rectangular) or large sizes, are available in various colors for 25 to 250 volts.



counters • sorters • safety control

PHOTOELECTRIC DEVICES

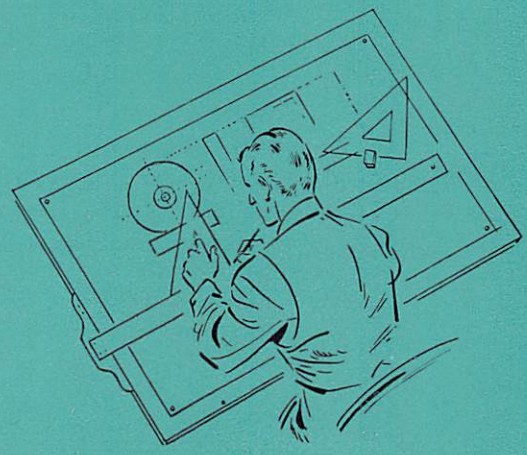
Westinghouse photoelectric devices are general-purpose relays operated by an increase or decrease in light. Light sources and Photo-troller with indoor or outdoor housings are available for operating distances up to 225 feet. Type F-1 transmitter-receiver with 3-inch lens is shown.



. . . switches . . . relays . . . contactors . . . indicating lamps

Key to Acceptance

Refined over many years of research and application experience, Westinghouse industrial duty devices meet the rigid demands of your customer—the engineer responsible for his plant's performance. These devices are already familiar to him and his operating personnel . . . they strike a note of confidence for any apparatus on which he sees them.



Selection Data

The devices used by engineers for the "management" of control and power circuits form an extensive list. A comprehensive catalog is not available, although typical apparatus groupings are shown on the opposite page.

Specific requirements should be outlined to your Westinghouse representative. He will gladly provide complete descriptions, dimensions, engineering data and any other assistance needed for a successful application.

ROTATING EQUIPMENT

Typical Applications

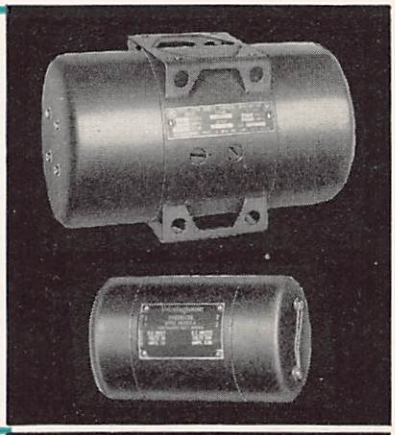
d-c to d-c power supply

DYNAMOTORS

Operates from low-voltage, d-c and supplies power for plate, grid and filament in electronic and radio equipment.

Transmitter dynamotor shown has enclosed, dustproof case, 6 to 28-volt input. Note two-position base mounting.

The receiver dynamotor is also enclosed in dustproof case. Input ranges from 6 to 28 volts, d-c and the unit may be built with or without base.

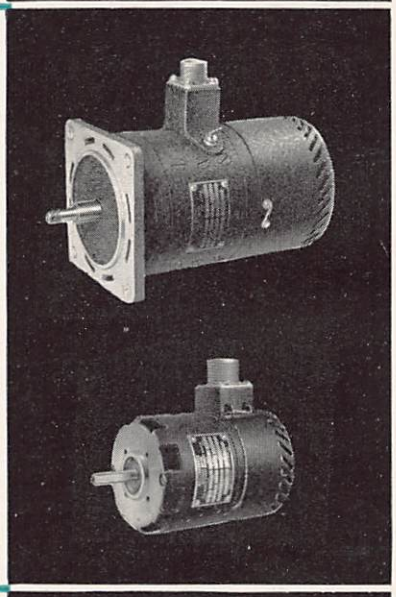


radar antennas • printers

MOTORS

Synchronous motors of standard construction are available in four types for a-c use. Units supplied to meet low watt input and low starting torque or high starting torque. Pull-in torque on all types is affected by inertia of connected load.

Aircraft motors built for 24-volt, d-c systems, designed for efficient operation under severe temperature, altitude and humidity variations. Top unit is 3⅛″ open, self-ventilated motor; bottom unit is 4″ open, self-ventilated motor.

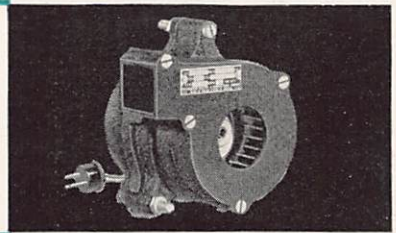


aircraft radio

BLOWERS

Quiet, efficient, lightweight for cooling and ventilation.

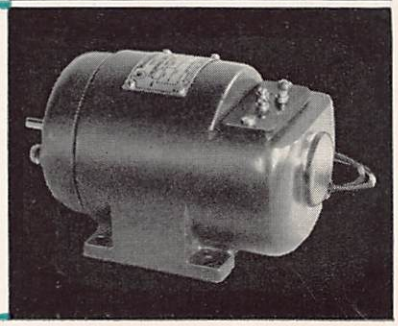
Blowers are available for 60 cycles, 3,000 rpm, and 400-800 cycles, 6,700 rpm.



electrical coupling

SYNCHROTIE

Synchrotie is a system in which two motor-like units are coupled together electrically only, but rotate and stop as if they were on the same mechanical shaft. A range of sizes is available—the small ones being used for remote position indication and recording; large units for operating equipment directly.



. . . dynamotors . . . motors . . . blowers . . .

Quick Product Facts

light weight

Westinghouse dynamotors, motors and blowers are lightweight and compact. Smooth, functional shapes are easy to fit into radio equipment and provide maximum space economy.

low ripple

All causes of ripple in dynamotors and d-c motors are closely controlled. Commutator bars, brushes, brush springs and iron are precision-controlled.

dependable, long life

Every Westinghouse dynamotor is built to operate 1,000 hours without servicing. Commutators are precision-turned and mirror-finished to assure long brush life and superior commutation.

quiet operation

Exacting precautions taken on dynamotors insure minimum noise levels. Armatures are dynamically balanced; bearings are checked individually and matched to end brackets within .0001".

excellent commutation

Commutators in Westinghouse dynamotors and d-c motors are carefully built, undercut and insulated. Commutator segments are given high potential test before and after winding. Brushes, holders and pressures are precision-controlled.

Selection Data

To apply the correct rotating unit, these six factors must be considered:

1. Electrical characteristics—input (and output) volts, amperes, phases, frequency, starting current limitations.

2. Horsepower—continuous rating, momentary overloads and their frequency.

3. Torque—maximum required starting torque and pull-out torque.

4. Temperature—maximum and minimum ambient operating temperature, maximum permitted temperature rise.

5. Overload protection—built-in Thermoguard relays.

6. Mechanical and miscellaneous details—speed, dimension limits, weight limits, ball or sleeve bearings, mounting—rigid or resilient, special shaft or quill, open, splash-proof, explosion-proof, moisture or fungus resistance, cost.

FOR MORE INFORMATION

Westinghouse Small Motor Selector (B-3075-B) is an excellent application guide.

Catalog information is available also on dynamotors, generators, blowers, relays, breakers and voltage regulators.

Type ADS synchrotie motor units for indication and recording are described in catalog section 43-249. Information on large synchroties is also available.

CAPACITORS . . . NETWORKS

Typical Applications

transmitters

•

electronic equipment

carrier current couplers

radar

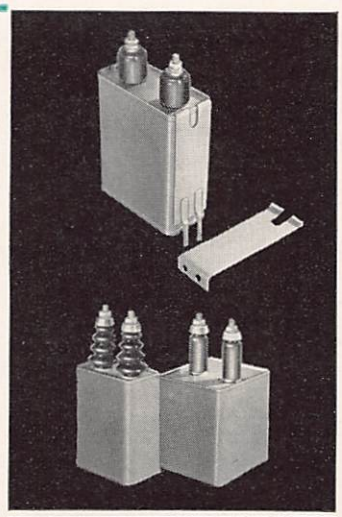
FL-70, FP-70

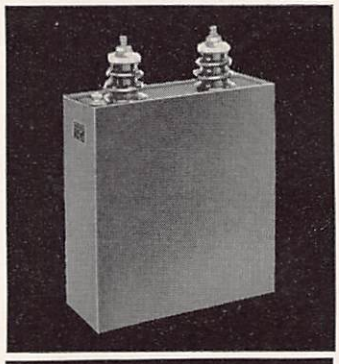
Westinghouse manufactures a complete line of fixed, paper-dielectric capacitors in hermetically-sealed metal cases. Inerteen—a stable, non-inflammable, nonexplosive liquid—and Inertex paper make up the dielectric. For special temperature requirements, mineral oil may be used.

FP capacitors—400 to 100,000 volts, d-c—are the highest quality industrial duty type. Conservative safety factors are used throughout. Solder-sealed bushings provide a degree of permanency that is unsurpassed. Cases are of heavy welded sheet steel.

FL capacitors—60 to 7,500 volts, d-c—are smaller, and are designed for normal service. They are assembled in soldered metal cases.

These capacitors may also be furnished to meet JAN-C-25 specifications, characteristics F and E in the CP-70 class.



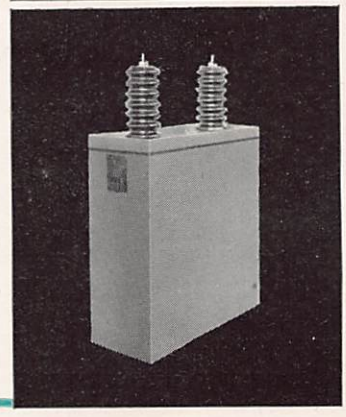


FPC

FPC porcelain-clad capacitors—7,500 to 250,000 volts—are adapted to high-voltage, low-capacity requirements. These capacitors are completely enclosed in a porcelain housing with the end caps Solder-sealed to the porcelain, making a hermetically-sealed construction. They can be supplied with low reactance foil construction upon specification.

PULSE FORMING NETWORKS

Westinghouse networks are available to meet specific requirements. They may be supplied in a wide range of voltages, pulse lengths and discharge rates. Oil or stabilized Inerteen impregnated paper is used for dielectric, according to the needs of the application.



. . . Inerteen and oil-filled

Quick Product Facts

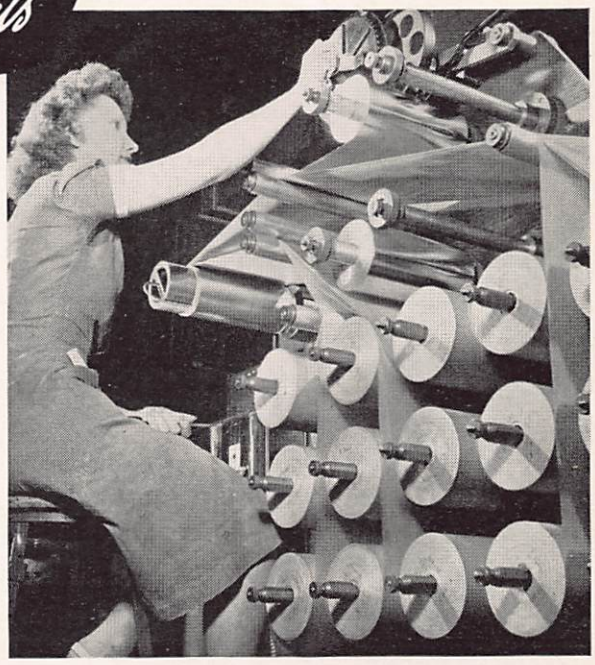
The principles of design in Westinghouse capacitors contain four important factors that assure communications and electronics designers of long, useful life under actual operating conditions.

1. Electrodes—Aluminum foil as electrode material insures greatest chemical stability and long life.

2. Dielectric Sheets—Inertex—A special capacitor paper of highly purified wood cellulose—is an exclusive feature that has proved superior to other materials for high-voltage, d-c service at both normal and elevated temperatures.

3. Impregnating Medium—Noninflammable, nonexplosive Inerteen insures maximum stability in high-temperature service of d-c capacitor applications.

4. Sealing and Housing—Solder-seal gives a hermetic seal between porcelain bushings and metal case. Solder-sealed porcelain-to-metal bushings, and welded or soldered case construction, completely eliminate gaskets and provide a hermetic seal that keeps dielectric in, moisture out.



Electronically-controlled winding machine for assembling working sections of aluminum foil and special Inertex dielectric paper.

Selection Data

STANDARD DERATING FOR CAPACITORS OPERATING IN HIGH AMBIENT TEMPERATURE

JAN-C-25 Size Group	Watt Second Rating	PERMISSIBLE OPERATING VOLTAGE IN PERCENT OF 40°C RATING										
		−55°C	−20°C	0°C	40°C	45°C	55°C	65°C	65°C	85°C	95°C	105°C
I*	0 to 5	000%	100	100	100	100	95	90	80	70	50	30
II	.5* to 5	100%	100	100	100	100	95	85	75	65	40	25
III	5+ to 50	100%	100	100	100	100	90	85	70	55	30	..
IV	50+	100%	100	100	100	100	85	80	65	45	..	..

*Size Group I is limited to capacitors rated 1,000 volts, or below. Above 1,000 volts, ratings of .5 watt-seconds, and below, are classified as Group II.

FOR MORE INFORMATION:

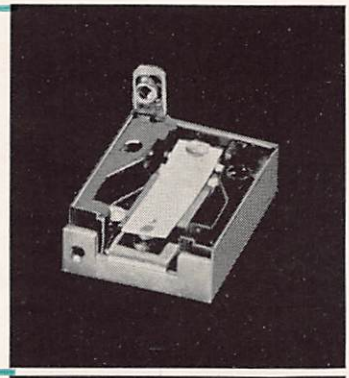
Complete selection data for capacitors is contained in Westinghouse Descriptive Data 49-225, which includes JAN specifications. Copies are available at your nearest Westinghouse office.

Typical Applications THERMOSTATS

crystal ovens

SPECIAL CRYSTAL OVEN THERMOSTAT

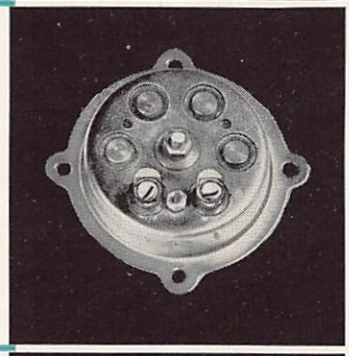
The small thermostat shown at the right was designed especially to control the temperature of a crystal oven. The accuracy of the control depends on the coordinated design of the thermostat and the oven. The user reports a total variation of frequency from a crystal operating at 5 megacycles to be considerably less than 50 cycles while the oven is operating in an ambient varying from minus 40°C to plus 70°C. The oven has no other temperature control.



over-temperature protectors

BUILT-IN WATCHMAN

Millions of Built-in Watchman thermostats are in use as over-temperature protection on motors. They are serving also on such applications in electronic equipment as guarding transformers, rectifiers and other components. Solid contacts are welded to the disc, and the circuit is interrupted at two points simultaneously. The molded plastic cup, on which the thermostat is assembled, limits the operating temperature to 310°F (154°C) or less.



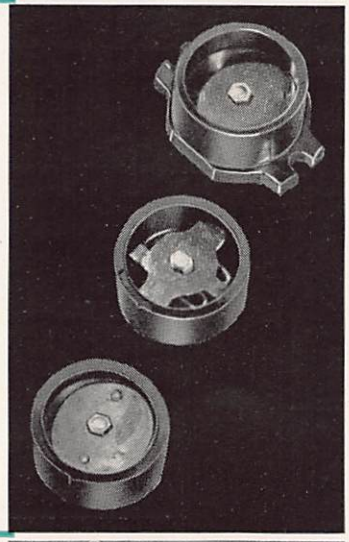
tube temperature limit controls

MISCELLANEOUS TYPES

The thermostats shown at the right are only three of many types and of many mountings available for such applications as temperature limit controls, tube warming and tube cooling.

Usually these thermostats are supplied with nickel-plated steel parts. Tin or cadmium-plated parts can be furnished on special order. On special order, stainless steel or Monel parts can be also furnished and with plated discs. This construction is generally acceptable where corrosion is a problem.

Maximum operating temperature is 650°F.

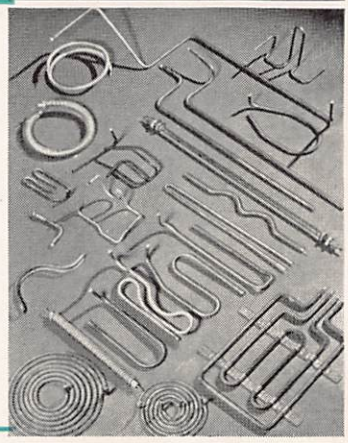


space, immersion and equipment heaters

HEATERS

Westinghouse provides various types of heating elements. Each has superior characteristics in those uses for which it is adapted. Among those available are mica-insulated heaters, plastic embedded elements for low-temperature applications, cartridge heaters for use up to 720°F in limited space, strip heaters and Corox heaters.

The illustration at the right shows special shapes of Corox heaters for platen and liquid heating and for casting in various metals. They are furnished with sheaths of copper, steel, stainless steel, aluminum or Inconel.



HEATERS

Quick Product Facts

As the world's largest user of Bi-metal for temperature control and protective devices, Westinghouse has developed and placed in use more than 6,000,000 thermostat elements in Westinghouse electrical devices alone. Careful manufacturing and thorough testing mean better performance . . . insert, mounting casing and terminals are riveted solidly in place; mica and porcelain insulation are used throughout; contacts are jig assembled; a torsiometer is used to check adjustment stem, stop, insert and terminal assemblies.

Characteristic	Built-in Watchman (illustrated on opposite page)	Guardsman	Sentinel (illustrated on opposite page)	Clostemp	Uni-Therm (illustrated on opposite page)
Quick-make—Quick-break	Yes	No	No	No	No
Current capacity	High	Medium	Good	Good	Good
Voltage range	125 d-c 125-250 a-c	115-230 a-c	115-230 a-c	115-230 a-c	115-230 a-c
Adjustable	*	Yes	Yes	Yes	Yes
Maximum temperature	310°F	650°F	650°F	650°F	650°F
High-altitude (50,000 feet) operation	Excellent	Good	Good	Good	Good
Vibration resistance	Excellent	Good	Good	Good	Good
Corrosion resistance	All thermostats can be made to resist corrosion—dampness, salt spray, etc.—by using brass, Monel or stainless steel parts.				

*Built-in Watchman thermostat can be built for adjustable operation, but it has a wider temperature differential than nonadjustable type.

Selection Data

There is a right and wrong way to buy thermostats and heating units. Don't wait until your product has been completely designed before ordering. Let Westinghouse engineers help you select and apply the correct unit. Follow these easy steps and you'll get a better final result and save materially in time and expense:

TO ORDER THERMOSTATS

1. Send complete detail drawing or sample of product.
2. Supply complete list of applications and names of products on which thermostat is to be used.
3. Specify results desired and describe processes involved.
4. Give maximum temperature differential allowed.
5. Specify watts, volts and frequency.
6. List current requirements.
7. Specify quantity involved and estimated total demand.

TO ORDER SPECIAL HEATERS

1. Send complete detail drawing or sample.
2. Supply complete outline of results desired and processes involved.
3. Specify rating in watts, volts and frequency.
4. Estimate quantities involved and total demand.

MORE INFORMATION

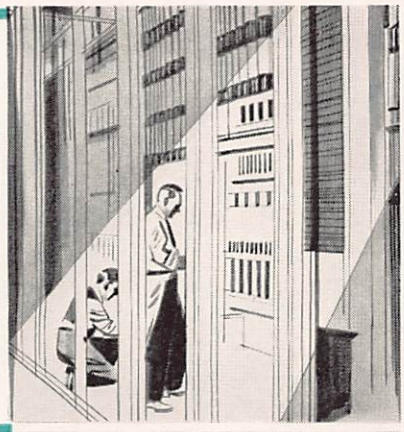
Ask your nearest Westinghouse office for booklet B-3344; it contains complete design and application data on Westinghouse Thermostats.

*PRECIPITRON

Typical Applications

telephone exchange

PRECIPITRON helps maintain the faultless operation of delicate relays in automatic telephone exchanges. Installed in the forced-air system, PRECIPITRON prevents tiny, unseen particles from fouling sensitive equipment by taking them out of the air within the ventilating duct itself. Experienced telephone exchange maintenance shows that conventional mechanical filters are unable to remove microscopic air-borne dust.

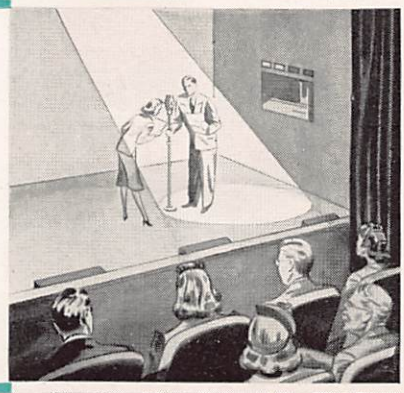


transmitter station

Addition of new services—FM, facsimile and television—increases the importance of cleanliness. Hand wiping of tubes and parts is expensive, requires additional man-hours, often causes broken connections, misaligned contacts and outages. PRECIPITRON cleaning of intake air practically eliminates hand cleaning, assures maximum freedom from outages. One installation large enough to handle requirements of all transmitters in the station is economical and entirely practicable.

studios

In offices, studios and other public places, PRECIPITRON removes the dirt, dust, smoke and soot which make necessary expensive cleaning, dusting and redecorating . . . damages valuable records . . . creates annoyance and discomfort. Tiny, unseen particles frequently cause the greatest damage, and it is these that PRECIPITRON clears from the air much more efficiently than any mechanical filter.



factory and laboratory

In plants manufacturing or assembling highly-finished precision parts, instruments and lenses, freedom from air-borne dirt and dust particles is essential. Minute, often invisible, abrasive and corrosive particles cause irreparable damage to superfinished surfaces and inaccuracies in sensitive instruments. PRECIPITRON, which clears the air of particles as small as 1/250,000 of an inch in diameter, is the only effective protection for such work.

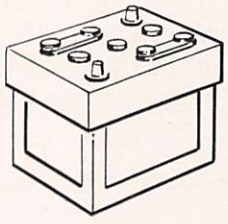
* Registered Trade Mark

. . the electronic air cleaner

Quick Product Facts

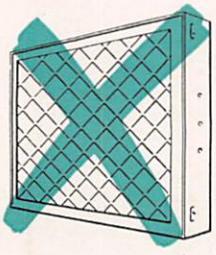
AUTOMATIC OR MANUAL CLEANING

Vertical collector plates make PRECIPITRON easy to clean. New built-in automatic cleaning attachment or manual cleaning. Collected dirt is flushed down drain in minutes. Plates dry quickly.



NO MOVING PARTS

PRECIPITRON has no more moving parts than a storage battery . . . few parts to wear out . . . maintenance is held to a minimum.



NOTHING TO CLOG

. . . and reduce efficiency of unit. PRECIPITRON continues to remove dirt from air with only negligible resistance in forced-air system.

SAFE

PRECIPITRON is approved by Underwriters' Laboratories and passed by them on standard flame tests for fire hazard on duct installations . . . without installation of additional fire protection apparatus.

UNMATCHED EFFICIENCY

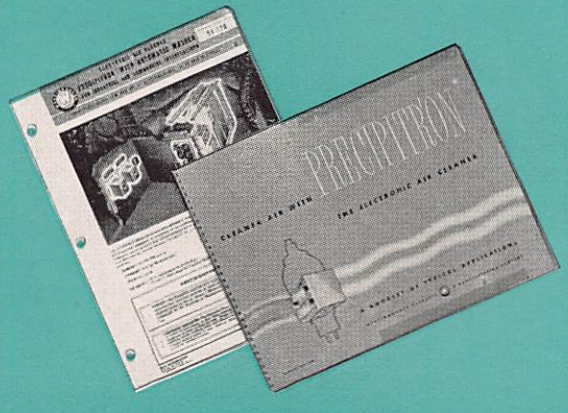
PRECIPITRON cleans the air of particles as small as 1/250,000 of an inch in diameter . . . delivers air 90% cleaner than possible with conventional mechanical filters.

EASY TO INSTALL

Newly designed cells are easy to install . . . can be mounted on top of each other in any practical number, arranged for vertical, downward or upward air flow . . . as well as for normal horizontal air flow.

Selection Data

Send for booklet B-3368 and Descriptive Data 59130 for complete selection and application data. Your nearest Westinghouse office will be glad to send you copies.



VOLTAGE REGULATORS

Typical Applications

transmitters

•

production

tube tester

transmitters

•

x-ray

machines

•

photographic

equipment

INDUCTION REGULATORS

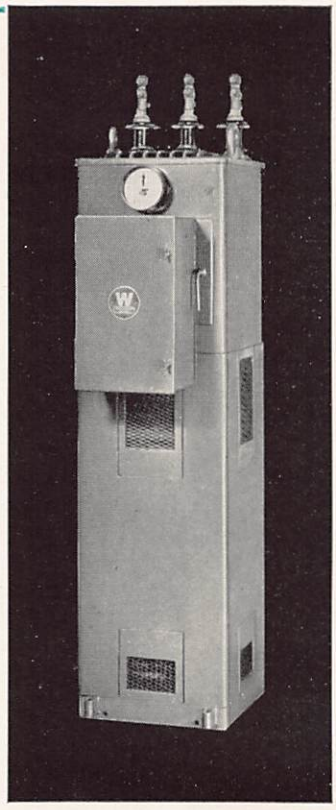
Induction voltage regulators provide stepless voltage control and stabilization for operating ranges as great as plus or minus 100%. They can be insulated for all voltages normally associated with electronic circuits, or may be used with transformers to obtain practically any voltage which may confront the engineer.

Westinghouse induction voltage regulators have been specifically designed for handling three situations:

1. *To adjust or maintain the radiated output of transmitters.* Here they are used to vary the voltage applied to the main rectifier. The voltage required may be quickly selected at a remote or local station by operating a miniature rheostat in the voltage relay circuit. The relay then operates the regulator automatically, brings it to a position which will supply the voltage selected and maintains that voltage despite variations in supply voltage. Regulators have often been used to keep a crippled station on the air at reduced power.

2. *To assure maximum cathode life and efficiency or to eliminate operating effects of varying voltage in heaters.* Here the regulator furnishes constant voltage, free from the normal fluctuation of power lines.

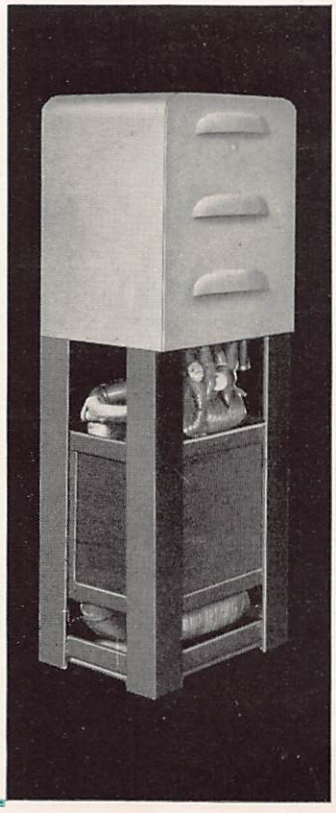
3. *In factory production-testing equipment for large tubes.* Here the regulator provides an efficient variable voltage which, in one specific instance, ranges from 600 volts to 20,000 volts on the d-c side of the rectifier.



STATIC REGULATORS

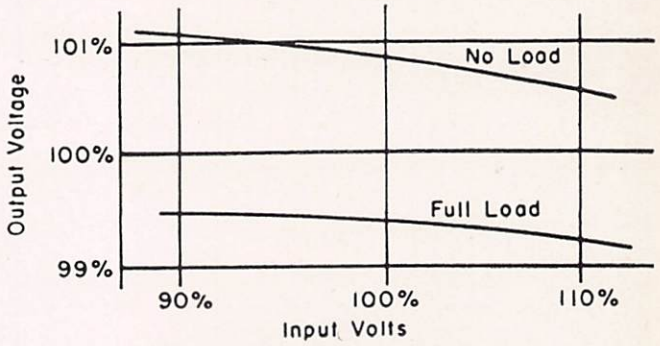
The static voltage regulator issues a stabilized voltage despite input voltage fluctuations not exceeding the operating range of the regulator. Response is almost instantaneous since there are no moving parts.

The efficiency, current limiting and voltage stabilization features of Westinghouse static regulators result from the inherent characteristics of the circuit used and the quality of the components. Standard ratings are available with outputs ranging from 50 to 1,500 volt amperes. Special designs are available beyond these limits.



. . . static . . . induction

Quick Product Facts



Typical performance curve for Type TS static regulator.

Westinghouse induction voltage regulators are built in three general types of construction.

AIR INSULATED—This regulator contains no liquids, and is made possible by recent developments in insulating materials and techniques of applying them. It is recommended for its safety, lightness and low maintenance.

INERTEEN INSULATED—For cooling and insulation, this regulator uses Inerteen—a noninflammable, nonexplosive liquid. It is recommended for indoor applications of large kva ratings, because no special safety provisions are needed.

OIL INSULATED—The long-standard insulating material used in this design is WEMCO "C" oil. Although generally recommended for use outdoors, such regulators may be used indoors if suitable safety provisions are made.

Westinghouse static voltage regulators are all of the dry-type. There are no moving parts. Output voltage is nonadjustable.

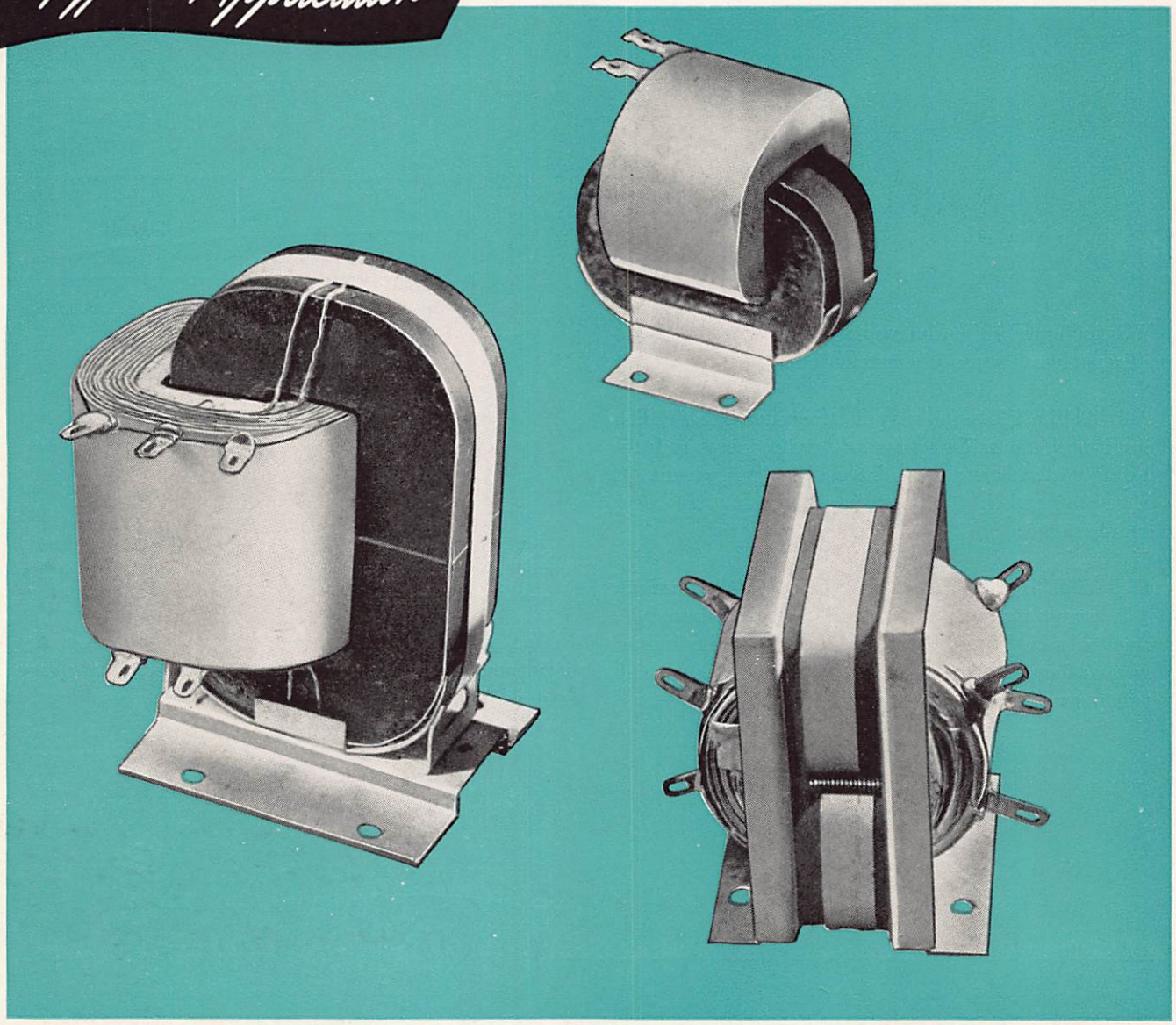
Selection Data

Ask your nearest Westinghouse office for Descriptive Bulletins 47-175, 47-165, 47-155, 47-125 and 47-210.

They'll give you complete information on the applications and selection of the proper regulator for electronic communications jobs.

HIPERSIL CORES

Typical Applications



Because of an orderly prearrangement of the iron crystals, Hipersil requires a smaller, external magnetizing force to produce a given flux than does ordinary silicon iron. This orientation gives Hipersil high permeability at both high and low densities in the direction of rolling, high incremental permeability, low losses. These core characteristics improve insulation and copper space factors in the component—an accumulative process. "RC" and "C" core construction carries its advantages to the design and economical production of transformers, chokes, reactors, loading coils and relays. As shown above, large exposed surfaces provide rapid heat dissipation—there is wide latitude for placement of terminals. Assembly is a single, quick, banding operation.

. . . radio transformers . . . chokes . . . reactors

Quick Product Facts

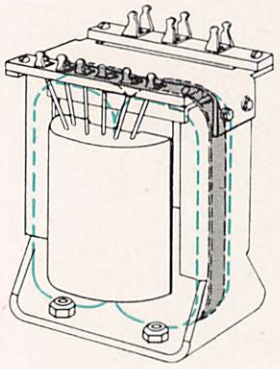
Smaller core cross sections and coils are possible.

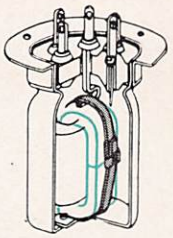
Lighter weight . . . savings of 30 to 50% for complete component common.

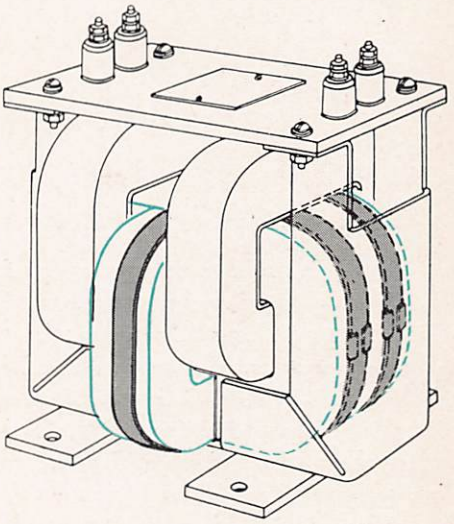
Knee of saturation curve for Hipersil is higher than for ordinary silicon iron. Approximately ⅓ greater straight-line response.

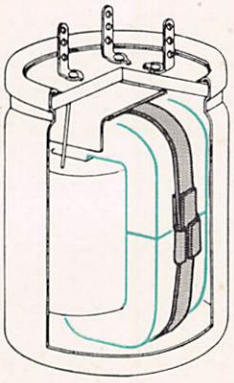
Simplified construction saves man-hours in assembly.

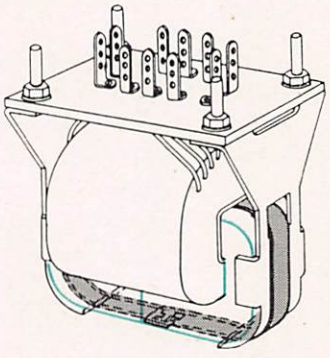
For power-frequency components, the type "RC" core is offered at new low prices.











Selection Data

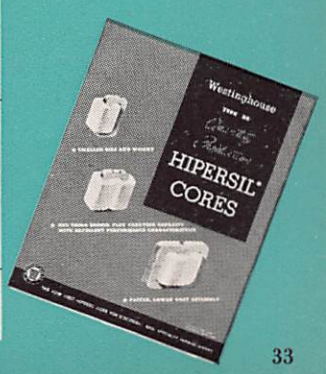
RECOMMENDED HIPERSIL CORE APPLICATIONS

GRADE	NORMAL APPLICATION	SPACE FACTOR
C-97 (29-gauge)	50 TO 60 CYCLES: Radio power, filament, rectifier, audio output transformers—filter and audio chokes Induction heating and other electronic transformer applications. Distribution transformers.	95%
C-95 (5 Mil)	400 TO 2,600 CYCLES: Radio power, filament, rectifier transformers and chokes. Induction heating and other electronic transformer applications. Aircraft power transformers	90%
C-98* (3 Mil)	ABOVE 2,600 CYCLES:	89%
C-91 (2 Mil)	Power pulse transformers. Blocking oscillator transformers Supersonic components	89%
C-90 (1 Mil)	IF and RF components Television components	88%

**Original thin-gauge development . . . has only ordinary grain orientation. All other grades shown are highly grain-oriented.*

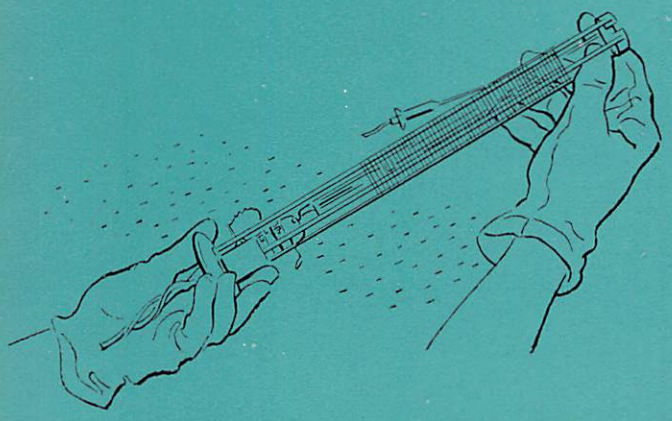
MORE INFORMATION

For complete information on "RC" cores ask for booklet B-3743. For type "C" cores—Ask for booklet B-3701.



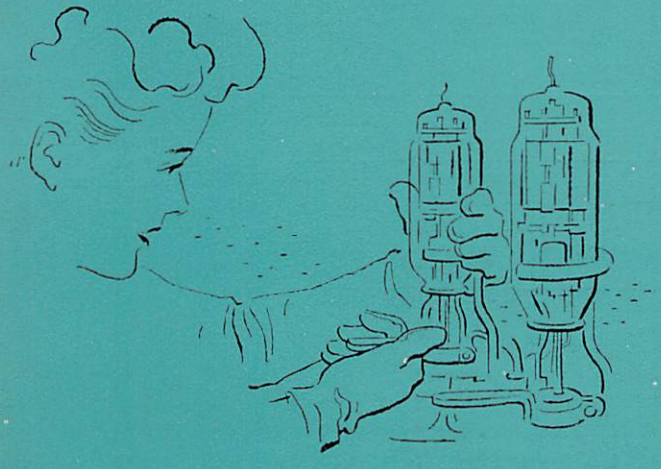
METALS AND ALLOYS

Typical Applications



MAGNETIC

Five Westinghouse metals are useful for a wide range of "soft" (nonpermanent) magnetic circuits. Hipernik, Conpernik and Hiperco are iron alloys for special transformers, chokes, etc.; Hipersil (see pages 30 and 31) is an oriented silicon steel; Puron is 99.95% pure iron, used for spectroscopic standards, and for research in magnetism. Each of these alloys possesses some property not found in other magnetic materials which—where applicable—will improve performance beyond the capacity of other materials.



ELECTRODE, FILAMENT, CONTACT METALS

Molybdenum, Tungsten and Cupaloy have individual properties as electrical conductors which account for their many uses in communication and electronic devices.

Tungsten—the backbone material for lamp and electronic tubes—has physical characteristics that fit it perfectly for filaments and countless specialized jobs. It is hard, dense and has a high melting point. It makes a perfect seal with glass.

The wide use of Molybdenum in tube parts is due particularly to the fact it can be made gas-free quite easily. Many relay contacts are made of pure or alloyed Molybdenum, and large sheets and blocks of the pure metal are finding new uses.

A third metal, Cupaloy, a nearly pure copper alloyed with silver and chromium, has high yield and tensile strengths at elevated temperatures. Its use is indicated where the softness of copper proves unsatisfactory.

SEALING METALS

Kovar "A" and Dumet are notable achievements in the search for permanent and hermetic bonds between metal and glass. Kovar "A" is used in large sections and makes a firm seal to hard glass; Dumet is used for lead-in wire and element supports.

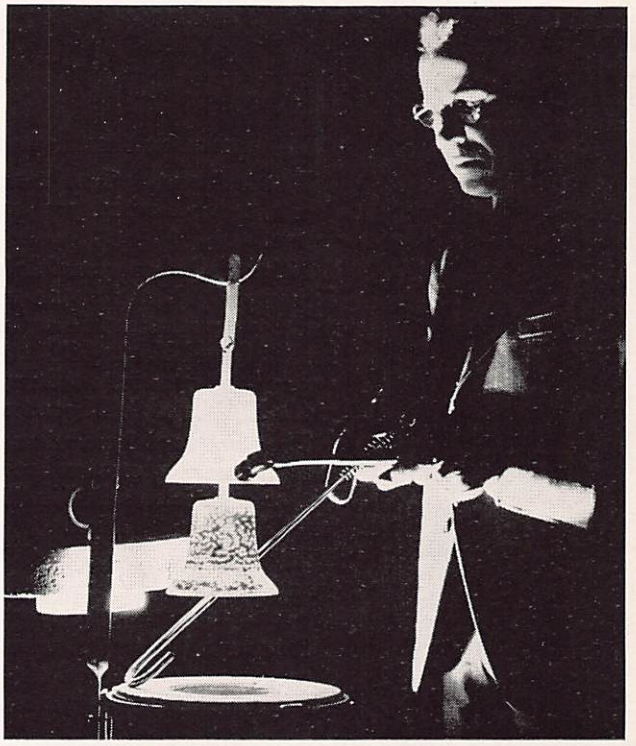
. . magnetic . . electrode . . filament . . sealing

HIGH-TEMPERATURE ALLOYS

K-42-B is a nickel-cobalt-chromium-iron alloy with great resistance to heat and corrosion. High tensile strength is obtained up to 1,500°F and high creep resistance is maintained up to 1,350°F.

K-42-B is used in high-temperature applications where strength, extremely low creep rate or resistance to oxidation and corrosion are required. It has proved itself in blades for gas turbines and superchargers; in springs, bolts and parts for furnaces.

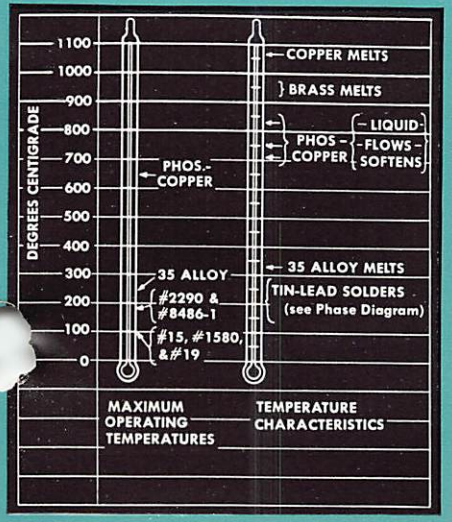
K-42-B is but one of a family of Westinghouse high-temperature alloys developed for specialized applications. You are invited to submit your requirements to the nearest Westinghouse office for specific recommendations.

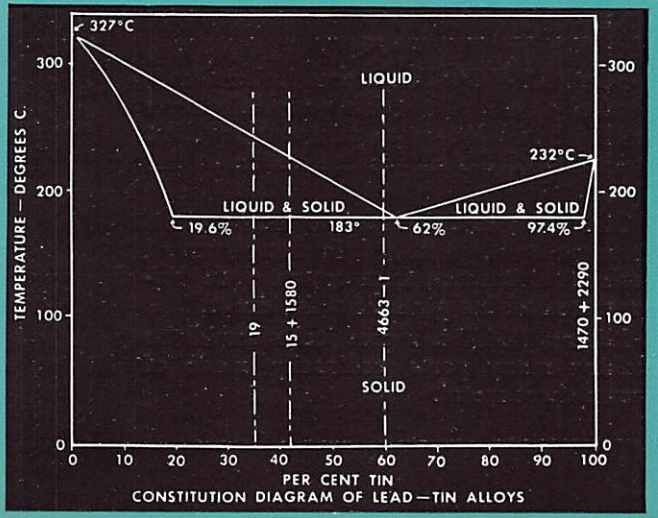


Here is graphic illustration of the unusual strength and elasticity of K-42-B at high temperatures. If two bells, one of K-42-B and the other of steel, are heated in a furnace to a full red heat (1475°F), then withdrawn and immediately struck with a hammer; the K-42-B bell will ring with a sustained, clear note, while the steel bell will respond with only a dull thud.

Application Data

Typical of the application help to be found in Metals and Alloys Booklet B-3369 are these charts for assisting in the selection of joining materials. Comparable information on all the other Westinghouse metals is included.





Typical Applications

laminated sheets and shapes

molded pieces

micarta "444"

MICARTA SHEETS AND SHAPES

Westinghouse offers twenty grades of sheets, most of which are available in black or tan.

Fillers include paper, fabric, asbestos and Glasweve. Of these, the most commonly used by communication engineers is Micarta tan (254) and black (464), both of which are paper base plastic, conforming to NEMA grade XXX and JAN grades LTS-E-4.

They are used for equipment panels, coil forms, switch plates and terminal boards. Either color is supplied in 36″ x 36″ sheets, from 1/32″ to 2″ thick.

Micarta 259 is made of Melomine resin on a base of Glasweve cloth. It is white, fire-resistant and very strong.

Standard Micarta shapes include angles, channels, zees, rods and tubes. All are produced in six or more grades, in a variety of dimensions.

MOLDED MICARTA

Molded Micarta is used for large production quantities of either simple or complicated shapes.

The material to be placed in the mold may be in one of four forms: (a) wood flour and plastic, (b) impregnated cloth or paper in laminated form, (c) impregnated cloth or paper chopped into small pieces, or (d) a combination thereof.

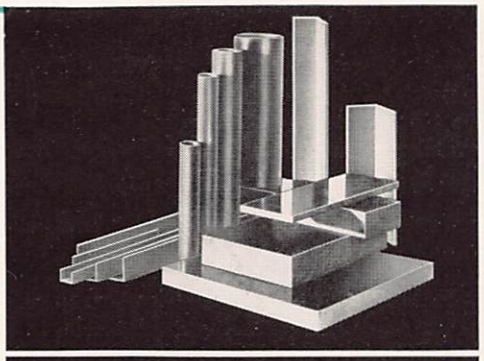
Grades using sheets and chopped pieces make the strongest parts. Those containing wood flour are particularly useful for intricate shapes.

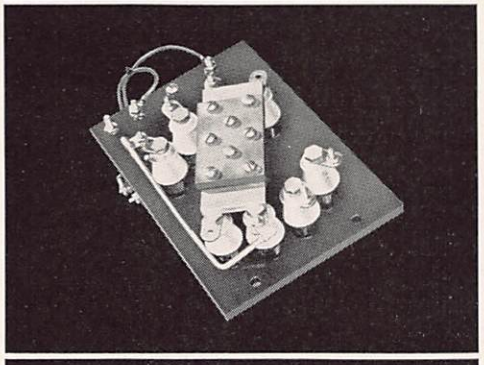
MICARTA "444"

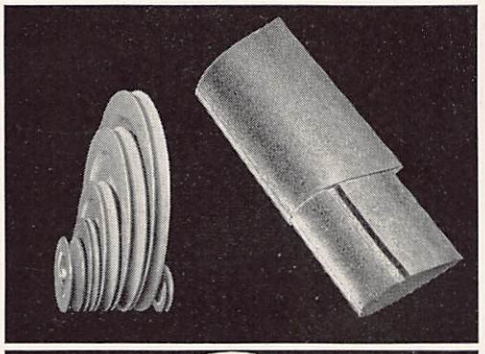
Micarta "444" offers a practical and economical means of obtaining molded forms or shapes with low-cost equipment and dies. Examples of the shapes are shown at the right.

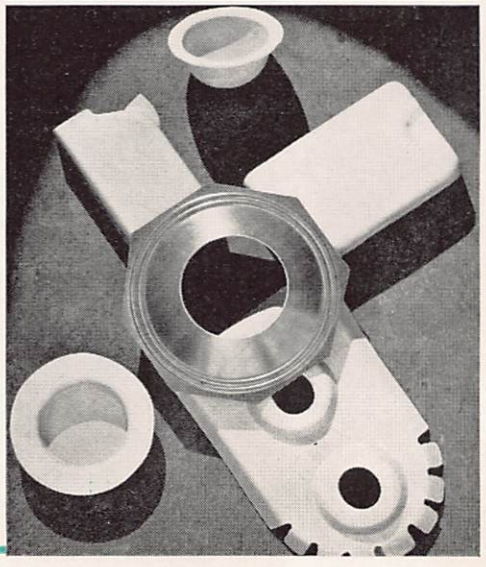
This form of Micarta is a tan or dark green product, processed in flat sheets of various thicknesses, from cotton cloth, impregnated with a phenolic resin binder.

Micarta "444" is a practical material for making many parts ordinarily made of drawn sheet metal.









. . . a family of industrial plastics

Quick Product Facts

Westinghouse Micarta is a family of plastics . . . the product of 36 years of continuous research and development. It has U.S. Army and Navy acceptance, and is recommended where strength, light weight and wearing qualities are essential.

The newest member of the Micarta family is "444". It is easily formed from flat, cured sheets on inexpensive and quickly built plastic or wood dies, in a simple arbor press with only 100 psi pressure. (See illustrations at right.)

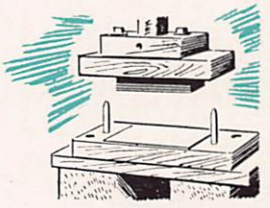
Whatever your product may be, or its electrical or mechanical requirements, you will probably find that one of the many grades of Westinghouse Micarta available is particularly suited to your needs.

Micarta is distinctly an industrial plastic . . . with the properties demanded by severe industrial service.

FORMING MICARTA "444"

JUST HEAT . . . premolded and cured sheets are heated uniformly on both sides by infrared lamps for specified time.

TRANSFER . . . heated sheet is then quickly placed in inexpensive wood mold in arbor press, or where pressure can be applied.

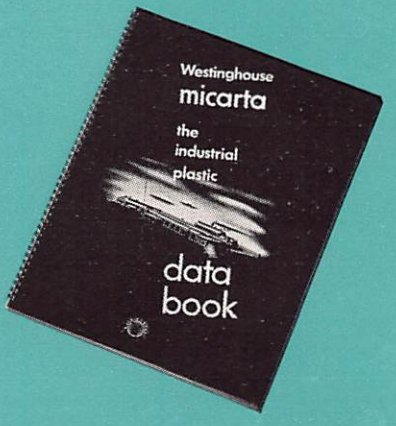


AND FORM . . . pressure of about 100 psi is applied and shape cooled briefly in mold.

Selection Data

This Data Book on Micarta has been designed as a working tool. It presents clearly and completely the technical facts about Micarta . . . the grades and forms in which it is supplied, and the chemical, mechanical and electrical properties of each. We believe it will prove a useful guide to the proper selection and application of industrial plastics. Ask for B-3184-B.

If you have a problem that might be solved by the use of industrial plastics, a Micarta specialist will gladly provide additional data and Micarta application experience.



INSULATING MATERIALS

Typical Applications

VARNISHES

Varnish insulations fall into five major classifications —air-drying, black and clear; baking, black and clear; and Thermoset.

Thermoset varnishes are especially suited to Class "B" insulation, but may also be used with excellent results on Class "A" insulation. They have flexibility after baking and will retain it under high temperatures. Processing time is short.

Air-drying varnishes are particularly well suited for tough, flexible finishes. Some are compounded for high oil resistance, others for weather resistance, etc.

FILLING COMPOUNDS

Westinghouse filling and sealing compounds are used in many ways . . . filling spaces in back of commutators, between armature connectors; sealing leads and bushings; filling spaces between coils; filling blowholes, compartments, potheads; transformer and condenser bushings and smoothing castings. One—a compound of two thin penetrating liquids—sets up in place without heat by polymerization. Thereafter, it does not soften or flow from heat. It has proved useful in pulse transformers and electromagnets.

TAPES

The variety of tapes available include asbestos, cotton, Glasweve, oil-packed and varnished cambric. Their properties include high tensile strength, good moisture resistance, high dielectric strength. They can be used for taping by hand or machine.

VARNISHED FABRICS

Westinghouse varnished fabrics include those made from asbestos, heavy canvas or a combination. They are used for end windings, slot insulation and protective coverings.

. . . for all types of industrial insulation

GLASWEVE

Glasweve braided sleeving is an untreated sleeving composed entirely of continuous filament glass fibers for high-temperature applications. It is available in either heavy or light wall thickness; can be treated to prevent ends from fraying; can be dyed red, blue, green or black.

• • •

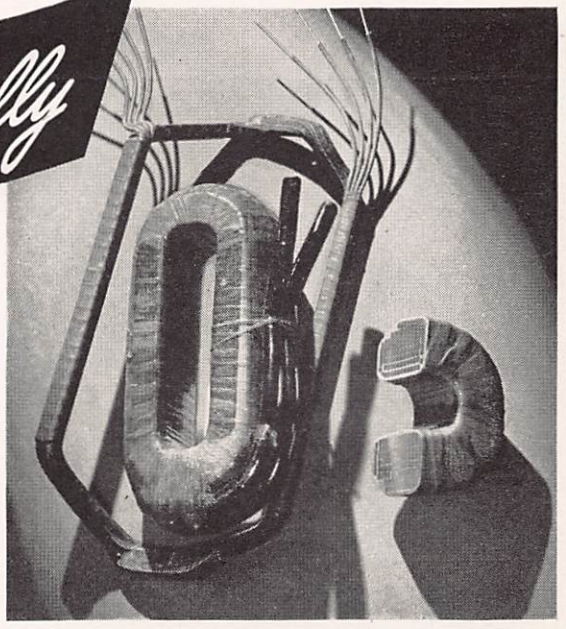
SLEEVING

Sleeving of asbestos or cotton is also available in a variety of grades suitable for most requirements.

PAPERS AND FIBERS

An extensive line of Westinghouse papers and fibers has been developed to meet almost every application. It includes asbestos papers and lumber, Copaco paper, express paper, fiber sheet, rod and tubes, fishpaper, fullerboard, Kraft and rope paper.

Choose Insulation Carefully

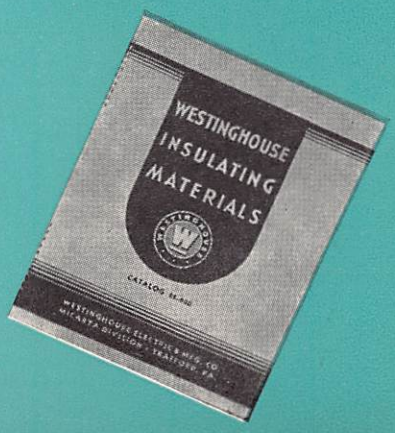


Insulation is perhaps the most important basic element in all electrical apparatus. It frequently provides the limits for final design in such factors as size, temperature rise, moisture resistance and economies.

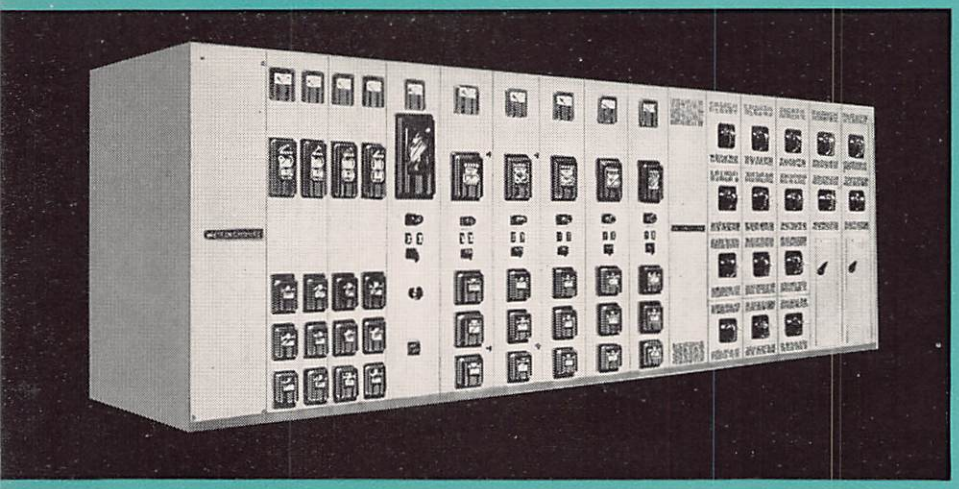
In the development and manufacture of all kinds of electrical apparatus, Westinghouse has thoroughly investigated all types of insulation, and this experience is offered you through your Westinghouse representative in the hope that it will provide the correct answer to your particular problems.

Selection Data

This new book devotes nearly 50 pages to application data for Westinghouse insulating materials. Your nearest Westinghouse office has a copy for you. Ask for Catalog 65-000.



SPECIAL PLANT AND



SWITCHGEAR

No longer need engineers locate switchgear in some remote place . . . causing operators lost time during emergencies or routine inspection.

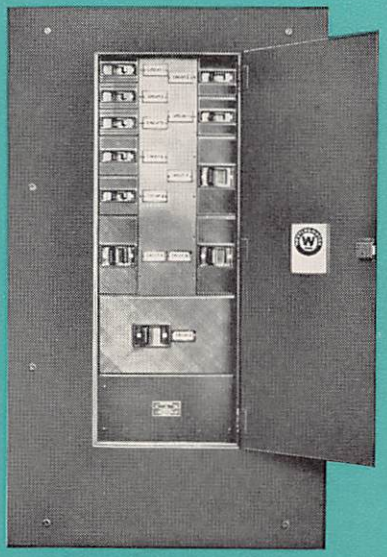
This space-saving Westinghouse Switchgear may be installed right in the main operating room. It concentrates control in minimum space, as convenient to the operator as his other control boards.

REGULATORS

Westinghouse induction voltage regulators are used:

1. To maintain the voltage at the plant power supply through fluctuations in load and incoming voltages.

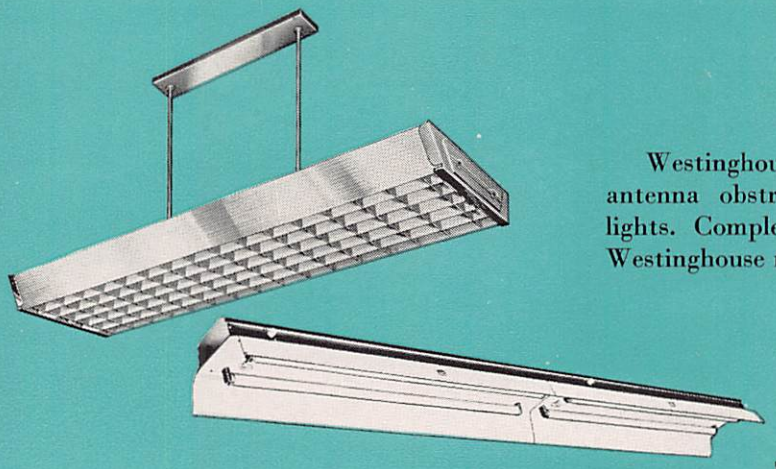
2. Where considerable power is involved—such as in production tube-testing facilities—to select the proper voltage from a range as great as 0-100% and maintain the selected voltage automatically for the duration of the test.



LIGHTING AND POWER PANELBOARDS

Westinghouse lighting and power panelboards meet the needs of modern wiring systems. Approved by Underwriters' Laboratories, Inc. Ask for Quick Selector Cat. 30-000 for engineering and application data.

OFFICE EQUIPMENT

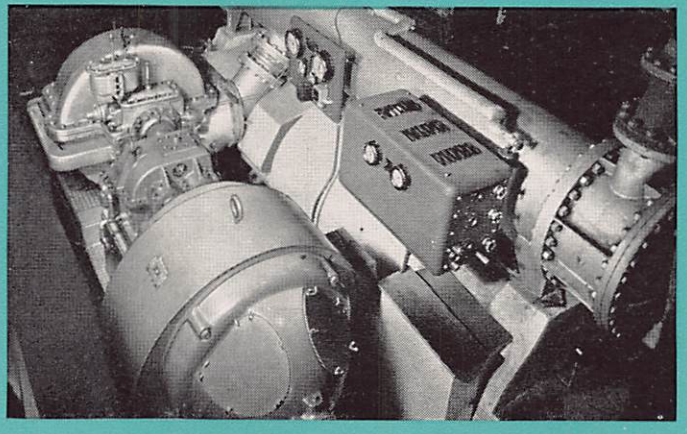


LIGHTING

Westinghouse has developed quality equipment for antenna obstruction lights, studio, station and yard lights. Complete information may be obtained from your Westinghouse representative.

PRECIPITRON

Recommended wherever cleanliness is essential, such as in the tube assembly plant illustrated. See pages 28 and 29.

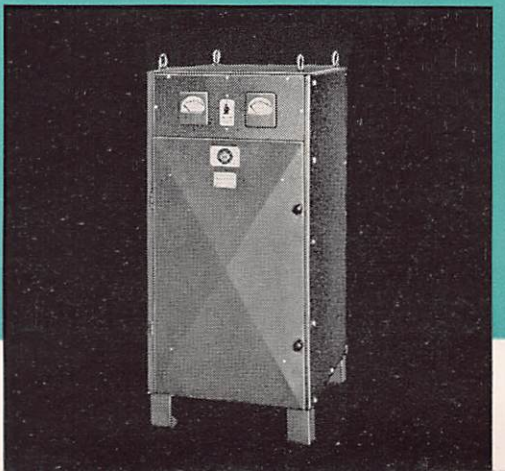


AIR CONDITIONING

Each unit in a Westinghouse air conditioning system is matched, in capacity and performance, to operate most efficiently with all other units in the system. Heart of the system is the famous Westinghouse hermetically-sealed unit. Complete information may be obtained from your Westinghouse representative.

RECTOX BATTERY CHARGERS

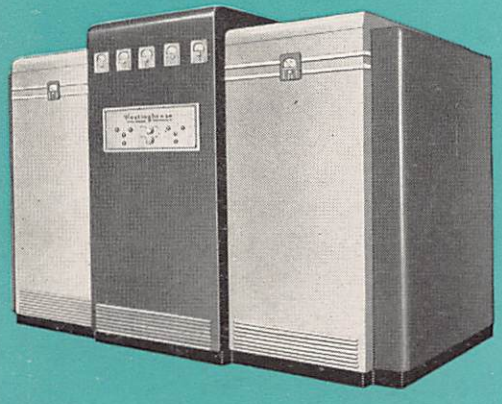
Four types of Rectox battery chargers are of special interest to communications and plant engineers—general purpose, telephone type, truck battery chargers, and the Rectomatic . . . a self-regulating charger for floating battery service. Your Westinghouse representative will be glad to give you complete information on any type or application.



SPECIAL PLANT AND

MOTOR CONTROLS

Westinghouse Mot-o-trol—electronic motor control—provides stepless, fast, efficient speed control. Eliminates cumbersome, space-wasting overhead equipment. Ask for B-3301 for complete information.

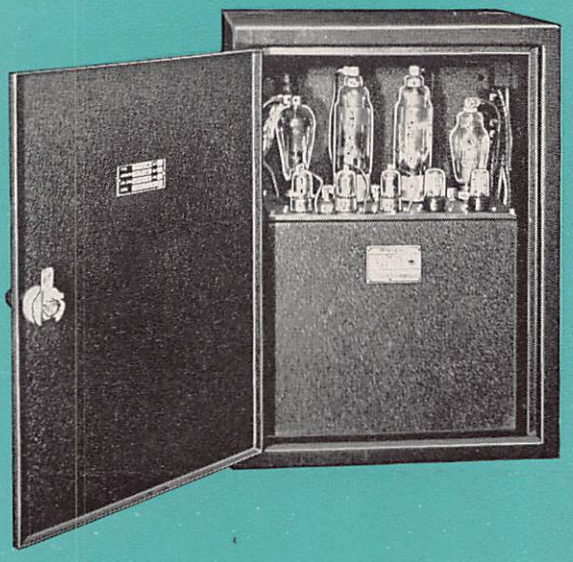


VIBROGRAPH

An easy-to-carry unit that records vibrations on a celluloid strip. The record is immediately available . . . no photographic processes are involved. The complete story is in B-3494.

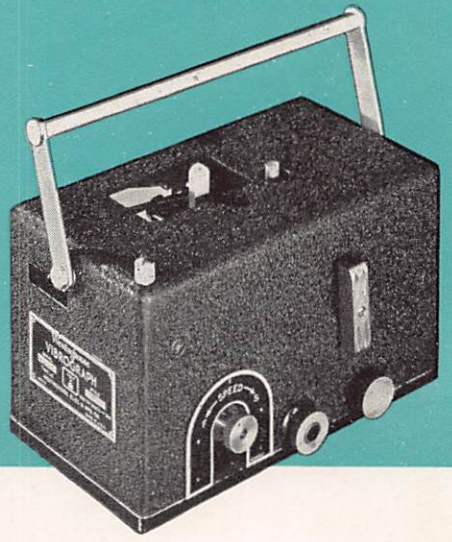
CONTROL CENTERS

Efficiency gains a new boost with the use of control centers to centralize operation of motors in industrial plants. Ask for B-3026 for the complete story of uses and ratings.

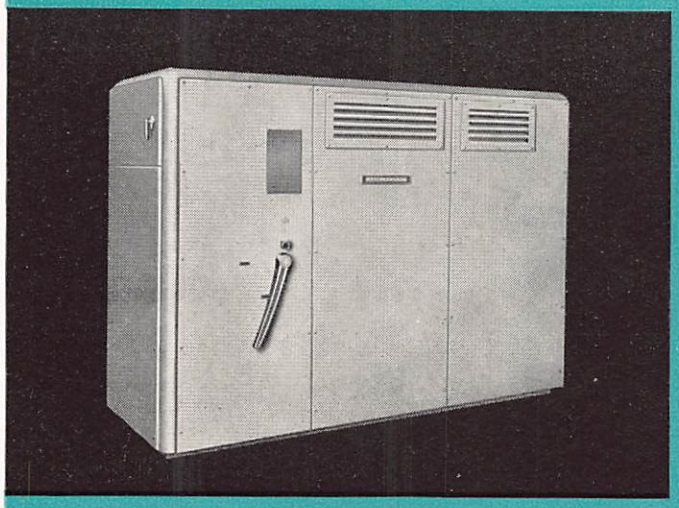


RADIO-FREQUENCY HEATING

R.F. heating has become a new, fast production tool for brazing, soldering, hardening, plywood bonding and preheating plastic molds. B-3620 has the information.



OFFICE EQUIPMENT

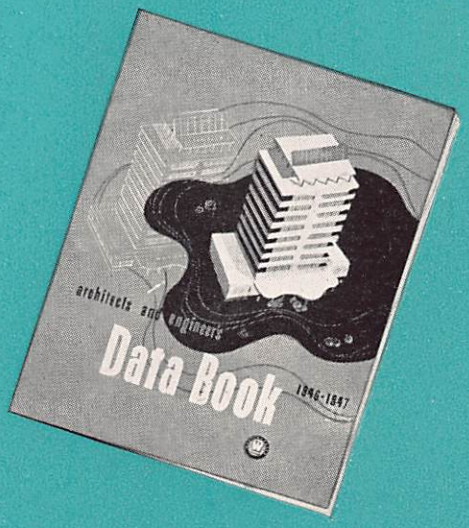


POWER CENTERS

Power centers provide power where you need it in a hurry. Can be installed at center of load, saving secondary cable. Air-cooled and Inerteen units can be installed overhead to save floor space. Get B-3216 for application data.

A useful tool for Plant and Broadcast Engineers

Write for your copy of the Westinghouse Architects' and Engineers' Data Book (B-2161-D). More than 300 pages of useful application information about electrical equipment and systems for commercial buildings and manufacturing plants. Write your nearest Westinghouse office for copy.



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